C21B

MANUFACTURE OF IRON OR STEEL (preliminary treatment of ferrous ores or scrap C22B1/00 ; electric heating H05B)

Definition statement

This subclass/group 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.

Relationship between large subject matter areas

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.

Informative references

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

<table>
<thead>
<tr>
<th>Furnaces, kilns, ovens or retorts in general</th>
<th>F27B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Details or accessories of furnaces, kilns, ovens or retorts in general</td>
<td>F27D</td>
</tr>
</tbody>
</table>

C21B 3/00

General features in the manufacture of pig-iron (mixers for pig-iron C21C1/06 )

C21B 3/02

by applying additives, e.g. fluxing agents

Definition statement

This subclass/group 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 within this group
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

Relationship between large subject matter areas
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 relevant to classification in this group
This subclass/group does not cover:

<table>
<thead>
<tr>
<th>Slag wool</th>
<th>C03B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slag stone</td>
<td>C04B</td>
</tr>
</tbody>
</table>

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 |

C21B 3/08
Cooling slag

Definition statement
This subclass/group covers:
Cooling covers both dry and wet methods of cooling.
### Informative references

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

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

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### C21B 5/00

**Making pig-iron in the blast furnace**

**Definition statement**

*This subclass/group 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.

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### C21B 5/06

**Using top gas in the blast furnace process (in coke ovens C10B)**

### Informative references

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

| In coke ovens | C10B |
| Purifying or modifying the chemical composition of combustible gases containing carbon monoxide | C10K |
| Production of fuel gases by carburetting air or other gases without pyrolysis or of combustible gases containing carbon monoxide from solid carbonaceous fuels | C10J |
Special rules of classification within this group
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 B66B9/06)

Definition statement
This subclass/group 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.

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

<table>
<thead>
<tr>
<th>Separating solids from solids by wet methods</th>
<th>B03B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic or electrostatic separation of solid materials from solid materials or fluids, separation by high-voltage electric fields</td>
<td>B03C</td>
</tr>
<tr>
<td>Centrifuges</td>
<td>B04B</td>
</tr>
<tr>
<td>Apparatus using free vortex flow, e.g. cyclones</td>
<td>B04C</td>
</tr>
<tr>
<td>Separation</td>
<td>B01D</td>
</tr>
<tr>
<td>Cleaning of gases from solids</td>
<td>B01D 45/00TO B01D 53/00</td>
</tr>
<tr>
<td>Filtering elements</td>
<td>B01D 24/00TO B01D 35/00</td>
</tr>
<tr>
<td>Filtering material</td>
<td>B01D 39/00</td>
</tr>
<tr>
<td>Purifying or modifying the chemical composition of combustible gases containing carbon monoxide</td>
<td>C10K</td>
</tr>
</tbody>
</table>
C21B 7/04
with special refractories (refractory materials C04B)

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

| Refractory materials | C04B |

C21B 7/06
Linings for furnaces

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, F27B 1/14 |
| Linings or walls for metallurgical furnaces in general | F27D 1/00, F27D 1/00 |

C21B 7/10
Cooling; Devices therefor

Definition statement
This subclass/group covers:
Cooling devices for the walls and bottom including staves, plates, pipes, etc; also leakage detection.

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

<p>| Linings or walls incorporating cooling arrangements | F27D 1/12, F27D 1/12 |
| Shaft furnaces with cooling arrangements | F27B 1/24, F27B 1/24 |
| Cooling of furnaces or of charges | F27D 9/00, F27D 9/00 |</p>
<table>
<thead>
<tr>
<th>Cooling of linings of combustion chambers</th>
<th>F23M 5/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat exchange apparatus in which heat exchange media do not come into direct contact</td>
<td>F28D</td>
</tr>
<tr>
<td>Details of heat exchange apparatus of general application</td>
<td>F28F</td>
</tr>
</tbody>
</table>

**C21B 7/12**

Opening or sealing the tap holes

**Informative references**

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


**C21B 7/14**

Discharging devices, e.g. for slag

**Definition statement**

*This subclass/group covers:*

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

**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, F27D 3/14 |

**C21B 7/16**
**Tuyéres**

**Informative references**

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

| Arrangements of tuyeres | F27B 1/16, F27B 1/16 |

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**C21B 7/20**

with appliances for distributing the burden

**Definition statement**

*This subclass/group covers:*

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

**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, F27B 1/20 |
| Charging of particulate material | F27D 3/00, F27D 3/00 |
| Charging directly from hoppers or chutes | F27D 3/10, F27D 3/10 |

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**C21B 7/22**

Dust arresters

**Informative references**

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

| Separating solids from solids by wet methods | B03B |
| Magnetic or electrostatic separation | B03C |
of solid materials from solid materials or fluids, separation by high-voltage electric fields

<table>
<thead>
<tr>
<th>Centrifuges</th>
<th>B04B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparatus using free vortex flow, e.g. cyclones</td>
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<tr>
<td>Separation</td>
<td>B01D</td>
</tr>
<tr>
<td>Cleaning of gases from solids</td>
<td>B01D 45/00 to B01D 53/96</td>
</tr>
<tr>
<td>Filtering elements</td>
<td>B01D 24/00 to B01D 35/34</td>
</tr>
<tr>
<td>Filtering material</td>
<td>B01D 39/00 to B01D 39/20</td>
</tr>
<tr>
<td>Purifying or modifying the chemical composition of combustible gases containing carbon monoxide</td>
<td>C10K</td>
</tr>
<tr>
<td>Removal of waste gases or dust (from converter)</td>
<td>C21C 5/38, C21C 5/38</td>
</tr>
<tr>
<td>Offtakes or separating apparatus for converter waste gases or dust</td>
<td>C21C 5/40, C21C 5/40</td>
</tr>
</tbody>
</table>

**C21B 7/24**

**Test rods or other checking devices**

**Definition statement**

*This subclass/group covers:*
Covers any measuring, controlling or observation devices

**Informative references**

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

<table>
<thead>
<tr>
<th>Arrangements of monitoring devices, of indicators, of alarm devices for shaft furnaces</th>
<th>F27B 1/28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrangements of controlling devices</td>
<td>F27D 19/00,</td>
</tr>
</tbody>
</table>
**C21B 9/00**  
Stoves for heating the blast in blast furnaces

**C21B 11/00**  
Making pig-iron other than in blast furnaces

**C21B 13/00**  
Making spongy iron or liquid steel, by direct processes

**Definition statement**

*This subclass/group 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.

**Informative references**

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

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

**Special rules of classification within this group**

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 subclass/group covers:
Also rotary-hearth furnaces.

**C21B 13/12**

in electric furnaces

**Definition statement**

This subclass/group covers:
Also using a plasma.

**C21B 13/14**

Multi-stage processes [N: processes carried out in different vessels or furnaces]

**Definition statement**

This subclass/group 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 C22B5/00; by electrolysis C25C1/06)

**Definition statement**

This subclass/group covers:
Also processes involving nuclear energy or a chloride process.

**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 to C22B 5/20 |