F23J REMOVAL OR TREATMENT OF COMBUSTION PRODUCTS OR COMBUSTION RESIDUES { (from fluidised-bed combustion apparatus F23C 10/24); FLUES (precipitating dust from flue gases B01D; composition of fuel C10; combustion apparatus for consuming smoke or fumes, e.g. exhaust gases, F23G 7/06) }

NOTE
This subclass covers the cleaning of external surfaces of water tubes of boilers

WARNING
In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00 Removing ash, clinker, or slag from combustion chamber { (arrangements for collecting bottom ash and flyash F23J 3/06; removing flyash from flue gas F23J 15/022) }

1/02 . Apparatus for removing ash, clinker, or slag from ash-pits, e.g. by employing trucks or conveyors, by employing suction devices

1/04 . Hand tools, e.g. rakes, pickers, tongs

1/06 . Mechanically-operated devices, e.g. clinker pushers (forming part of the grate F23H)

1/08 . Liquid slag removal

3/00 Removing solid [deposited] residues from passages or chambers beyond the fire, e.g. from flues by soot blowers { (soot blowers per se F28G 1/16) }

3/02 . Cleaning furnace tubes; Cleaning flues or chimneys (by means which do not differ materially from the cleaning of any other tube once the fire is out B08B)

3/023 . . [cleaning the fireside of watertubes in boilers]

3/026 . . [cleaning the chimneys]

3/04 . Traps

3/06 . Systems for accumulating residues from different parts of furnace plant

7/00 Arrangement of devices for supplying chemicals to fire (supplying chemicals to fire:C10L ; to fumes F23J 15/003)

9/00 Preventing premature solidification of molten combustion residues

11/00 Devices for conducting smoke or fumes, e.g. flues ((removing fumes other than combustion fumes from the area where they are produced, in general B08B 15/00); heat insulation therefor E04B 1/94; chimneys E04H 12/28; removing cooking fumes from domestic stoves or ranges F24C 15/20 ; fume conduits of furnaces, kilns, ovens, or retorts F27D 17/002)}

11/02 . for conducting smoke or fumes originating from various locations to the outside, e.g. in locomotive sheds, in garages

11/04 . in locomotives; in road vehicles; in ships

11/06 . . for conducting smoke horizontally

11/08 . for portable apparatus

11/10 . for tents; for log huts; for other inflammable structures

11/12 . Smoke conduit systems for factories or large buildings

13/00 Fittings for chimneys or flues (staying, stiffening E04H; means for facilitating climbing E06C; draught-inducing apparatus associated with chimneys or flues F23L)

13/02 . Linings; Jackets; Casings

13/025 . . [composed of concentric elements, e.g. double walled (in general F16L; terminals for balanced flue arrangements F23L 17/04)]

13/04 . Joints; Connections (pipe joints in general F16L)

13/06 . Mouths; Inlet holes

13/08 . Doors or covers specially adapted for smoke-boxes, flues, or chimneys (in general E06B)

15/00 Arrangements of devices for treating smoke or fumes (treating smoke or fumes, see the relevant class for the treatment, e.g. B01D 53/00)

15/003 . [for supplying chemicals to fumes, e.g. using injection devices (to fire F23J 7/00) ]

15/006 . [Layout of treatment plant]

15/02 . of purifiers, e.g. for removing noxious material (traps for solid [deposits] F23J 3/04)

15/022 . . [for removing solid particulate material from the gasflow]

15/025 . . . [using filters]

15/027 . . . [using cyclone separators]

15/04 . . using washing fluids { (scrubbers for removing solids only F23J 15/022) }
Flue gas duct systems

- Balanced flues (combining air supply and flue gas exhaust)
- with coaxial duct arrangement
- Common flues for several combustion devices
- Chimney or flue associated with building ventilation system
- Chimney with internal flue pipe system

Chimneys or flues

- Linings
- Fastening means therefor
- Joints; Connections
- between stack and branch pipes
- between duct or stack sections
- between stack/duct and combustion apparatus
- Sealing arrangements
- Specific materials
- flexible
- plastic
- metallic
- ceramic
- glass
- Heat insulation fittings
- Top cover
- Service arrangements
- Safety arrangements

Preventing emissions (solids only F23J 2217/00)

- Nitrogen; Compounds thereof
- Nitrous oxide (N₂O)
- Sulfur; Compounds thereof
- Halogen; Compounds thereof
- Dioxins; Furans
- Carbon monoxide
- Carbon dioxide
- Heavy metals; Compounds thereof

Intercepting solids

- by filters
- Baghouse type
- electrostatic
- ultrafine [HEPA]
- High temperature resistant (ceramic) type
- Granular bed
- by baffles
- by screens
- by cyclones
- by cleaning fluids (washers or scrubbers)
- using settling/precipitation chambers

Treatment devices

- Catalytic reduction devices
- Non-catalytic reduction devices
- Reducing species generators, e.g. plasma, corona
- Sorption devices using carbon, e.g. coke
- Sorption with wet devices, e.g. scrubbers
- Sorption with semi-dry devices, e.g. with slurries

Sorption with dry devices, e.g. beds

Condensing contaminants with coolers

Quenching

Ash removal, handling and treatment means; Ash and slag handling in pulverulent fuel furnaces; Ash removal means for incinerators

Ash removal means associated with ash removal means

Separating water from ash

Mixing water to ash

Airlock sealing associated with ash removal means

Thermal treatments of ash, e.g. temper or shockcooling for granulation

Controls related to ash or slag extraction

Removing ashes from the ash pit using reciprocating means, e.g. pushers

Conducting systems with a gas flow bypass from main flue to an auxiliary flue

Modelling systems adapted for designing arrangements for conducting or purifying combustion fumes, e.g. flues

Preventing or reducing corrosion in chimneys

Initial heating of the flue before starting combustion

Means for reducing the noise in smoke conducting ducts or systems

Water draining devices associated with flues

Protections for chimneys or flue tops against external factors, e.g. birds

Devices for heating the chimney top to avoid ice formation

Means for supporting the lining of conducting means, e.g. ducts or chimneys

Manufacturing processes for the lining of conducting means, e.g. by extrusion

Ducts with non-circular cross-section

Irradiating fumes with electron or light beams, e.g. UV, for oxidizing or dissociating SOx and NOx

Cleaning fumes by letting them to pass a molten metal bath

Supplying fumes with ozone

Preventing plume emission at chimney outlet

Preventing emission of hexavalent chromium at the chimney outlet

Electrochemical cell filters

Magnetic filters

Photocatalytic filters

Cyclone walls forming heat exchangers

Cyclone separators with horizontal axis

Preventing emission of CO₂ at the chimney outlet by using sea weeds filters or absorbers

Means for absorbing SOx using seawater
2900/15061. Deep cooling or freezing of flue gas rich of CO$_2$ to deliver CO$_2$-free emissions, or to deliver liquid CO$_2$

2900/15081. Reheating of flue gases