

SECTION F — MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

F22 STEAM GENERATION

F22B METHODS OF STEAM GENERATION; STEAM BOILERS (steam engine plants where engine aspects predominate F01K; removal of combustion products or residues, e.g. cleaning of the combustion contaminated surfaces of tubes of boilers, F23J 3/00; domestic central-heating systems using steam F24D; heat exchange or heat transfer in general F28; generation of vapour in the cores of nuclear reactors G21)

Note(s)

This subclass covers only methods of, or apparatus for, the generation of steam under pressure for heating or power purposes.

Subclass index

METHODS FOR STEAM GENERATION.....	1/00, 3/00
STEAM BOILERS	
General characteristics	
having drum; having furnace tube; having fire tube; having combined fire tube and water tube;	
having fire-box.....	5/00, 7/00, 9/00, 11/00, 13/00
having water tubes	
auxiliary tubes.....	11/00
horizontal; horizontally-inclined; combined horizontally-inclined and vertical; vertical or	
steeply-inclined.....	15/00, 17/00, 19/00, 21/00
formed of sets of spaced double-walled water tubes or of return tubes; water tubes with	
internally-arranged flue tubes.....	23/00, 25/00
Special characteristics.....	27/00, 29/00
Modifications or arrangements; details of general application.....	31/00, 37/00
PLANTS; CONTROL SYSTEMS.....	33/00, 35/00

1/00	Methods of steam generation characterised by form of heating method (use of solar heat F24J 2/00; jackets or other cooling means in which steam is generated and which serve for cooling other apparatus, <u>see</u> the subclasses for such apparatus)	1/24	• • Pressure-fired steam boilers, e.g. using turbo air compressors actuated by hot gases from boiler furnace
1/02	• by exploitation of the heat content of hot heat carriers	1/26	• • Steam boilers of submerged-flame type, i.e. the flame being surrounded by, or impinging on, the water to be vaporised
1/04	• • the heat carrier being hot slag, hot residues, or heated blocks, e.g. iron blocks	1/28	• in boilers heated electrically
1/06	• • the heat carrier being molten; Use of molten metal, e.g. zinc, as heat transfer medium	1/30	• • Electrode boilers
1/08	• • the heat carrier being steam	3/00	Other methods of steam generation; Steam boilers not provided for in other groups of this subclass
1/10	• • • released from heat accumulators	3/02	• involving the use of working media other than water
1/12	• • • produced by an indirect cyclic process	3/04	• by drop in pressure of high-pressure hot water within pressure-reducing chambers, e.g. in accumulators (steam accumulators <u>per se</u> F01K 1/00)
1/14	• • • coming in direct contact with water in bulk or in sprays	3/06	• by transformation of mechanical, e.g. kinetic, energy into heat energy
1/16	• • the heat carrier being hot liquid or hot vapour, e.g. waste liquid, waste vapour	3/08	• at critical or supercritical pressure values
1/18	• • the heat carrier being a hot gas, e.g. waste gas such as exhaust gas of internal-combustion engines (use of waste heat of combustion engines, in general, F02)	5/00	Steam boilers of drum type, i.e. without internal furnace or fire tubes, the boiler body being contacted externally by flue gas
1/20	• using heat evolved in a solution absorbing steam; Soda steam boilers	5/02	• with auxiliary water tubes outside the boiler body
1/22	• using combustion under pressure substantially exceeding atmospheric pressure	5/04	• Component parts thereof; Accessories therefor (covers or similar closure members for pressure vessels in general F16J 13/00)

- 7/00 Steam boilers of furnace-tube type, i.e. the combustion of fuel being performed inside one or more furnace tubes built-in in the boiler body**
- 7/02 • without auxiliary water tubes
 - 7/04 • with auxiliary water tubes
 - 7/06 • • inside the furnace tube in transverse arrangement
 - 7/08 • • inside the furnace tube in longitudinal arrangement
 - 7/10 • • outside the boiler body
 - 7/12 • with auxiliary fire tubes; Arrangement of header boxes providing for return diversion of flue gas flow
 - 7/14 • with both auxiliary water tubes and auxiliary fire tubes
 - 7/16 • Component parts thereof; Accessories therefor, e.g. stay-bolt connections
 - 7/18 • • Walling of flues; Flue-gas header boxes
 - 7/20 • • Furnace tubes
- 9/00 Steam boilers of fire-tube type, i.e. the flue gas from a combustion chamber outside the boiler body flowing through tubes built-in in the boiler body**
- 9/02 • the boiler body being disposed upright, e.g. above the combustion chamber
 - 9/04 • • the fire tubes being in upright arrangement
 - 9/06 • • • Arrangement of header boxes providing for return diversion of flue gas flow
 - 9/08 • • the fire tubes being in horizontal arrangement
 - 9/10 • the boiler body being disposed substantially horizontally, e.g. at the side of the combustion chamber
 - 9/12 • • the fire tubes being in substantially-horizontal arrangement
 - 9/14 • • • Arrangement of header boxes providing for return diversion of flue gas flow
 - 9/16 • the boiler body containing fire tubes disposed crosswise in inclined upward arrangement
 - 9/18 • Component parts thereof; Accessories therefor, e.g. stay-bolt connections
- 11/00 Steam boilers of combined fire-tube type and water-tube type, i.e. steam boilers of fire-tube type having auxiliary water tubes**
- 11/02 • the fire tubes being in upright arrangement
 - 11/04 • the fire tubes being in horizontal arrangement
- 13/00 Steam boilers of fire-box type, i.e. the combustion of fuel being performed in a chamber or fire-box with subsequent flue(s) or fire tube(s), both chamber or fire-box and flues or fire tubes being built-in in the boiler body**
- 13/02 • mounted in fixed position with the boiler body disposed upright
 - 13/04 • mounted in fixed position with the boiler body disposed substantially horizontally
 - 13/06 • Locomobile, traction-engine, steam-roller, or locomotive boilers
 - 13/08 • • without auxiliary water tubes inside the fire-box
 - 13/10 • • with auxiliary water tubes inside the fire-box
 - 13/12 • • • the auxiliary water tubes lining the fire-box
 - 13/14 • Component parts thereof; Accessories therefor
 - 13/16 • • Stay-bolt connections, e.g. rigid connections
 - 13/18 • • • Flexible connections, e.g. of ball-and-socket type
- 15/00 Water-tube boilers of horizontal type, i.e. the water-tube sets being arranged horizontally**
- 17/00 Water-tube boilers of horizontally-inclined type, i.e. the water-tube sets being inclined slightly with respect to the horizontal plane**
- 17/02 • built-up from water-tube sets in abutting connection with two header boxes in common for all sets, e.g. with flat header boxes
 - 17/04 • • the water-tube sets being inclined in opposite directions, e.g. crosswise
 - 17/06 • • the water-tube sets being bent angularly
 - 17/08 • • the water-tube sets being curved
 - 17/10 • built-up from water-tube sets in abutting connection with two sectional headers each for every set, i.e. with headers in a number of sections across the width or height of the boiler
 - 17/12 • • the sectional headers being in vertical or substantially-vertical arrangement
 - 17/14 • • the sectional headers being in horizontal or substantially-horizontal arrangement
 - 17/16 • Component parts thereof; Accessories therefor
 - 17/18 • • Header boxes; Sectional headers
- 19/00 Water-tube boilers of combined horizontally-inclined type and vertical type, i.e. water-tube boilers of horizontally-inclined type having auxiliary water-tube sets in vertical or substantially-vertical arrangement**
- 21/00 Water-tube boilers of vertical or steeply-inclined type, i.e. the water-tube sets being arranged vertically or substantially vertically**
- 21/02 • built-up from substantially-straight water tubes
 - 21/04 • • involving a single upper drum and a single lower drum, e.g. the drums being arranged transversely
 - 21/06 • • • the water tubes being arranged annularly in sets, e.g. in abutting connection with drums of annular shape
 - 21/08 • • • the water tubes being arranged sectionally in groups or in banks, e.g. bent over at their ends
 - 21/10 • • • the water tubes being arranged in staggered rows
 - 21/12 • • involving two or more upper drums and two or more lower drums, e.g. with crosswise-arranged water-tube sets in abutting connection with drums
 - 21/14 • • involving a single upper drum and two or more lower drums
 - 21/16 • • • the lower drums being interconnected by further water tubes
 - 21/18 • • involving two or more upper drums and a single lower drum
 - 21/20 • • involving sectional or subdivided headers in separate arrangement for each water-tube set
 - 21/22 • built-up from water tubes of form other than straight or substantially straight
 - 21/24 • • bent in serpentine or sinuous form
 - 21/26 • • bent helically, i.e. coiled
 - 21/28 • • bent spirally
 - 21/30 • • bent in U-loop form
 - 21/32 • • • disposed horizontally in abutting connection with upright headers or rising water mains
 - 21/34 • built-up from water tubes grouped in panel form surrounding the combustion chamber, i.e. radiation boilers
 - 21/36 • • involving an upper drum or headers mounted at the top of the combustion chamber
 - 21/38 • • Component parts thereof, e.g. prefabricated panels
 - 21/40 • built-up from water tubes arranged in a comparatively long vertical shaft, i.e. tower boilers

F22B

- 37/16 • • • Return bends
 - 37/18 • • • Inserts, e.g. for receiving deposits from water
 - 37/20 • • • Supporting arrangements, e.g. for securing water-tube sets (construction of tube walls of furnaces including boiler furnaces F23M 5/08)
 - 37/22 • • Drums; Headers; Accessories therefor (making boilers from sheet metal B21D 51/24; pressure vessels in general F16J 12/00; covers or similar closure members for pressure vessels in general F16J 13/00)
 - 37/24 • • Supporting, suspending, or setting arrangements, e.g. heat shielding (frames, engine beds F16M)
 - 37/26 • • Steam-separating arrangements (vapour-liquid separators, e.g. for drying steam, B01D, B04)
 - 37/28 • • • involving reversal of direction of flow
 - 37/30 • • • using impingement against baffle separators
 - 37/32 • • • using centrifugal force
 - 37/34 • • Adaptations of boilers for promoting water circulation (auxiliary devices for promoting water circulation F22D 7/00)
 - 37/36 • • Arrangements for sheathing or casing boilers
 - 37/38 • • Determining or indicating operating conditions in steam boilers, e.g. monitoring direction or rate of water flow through water tubes (measuring or indicating instruments in general G01)
 - 37/40 • • Arrangements of partition walls in flues of steam boilers, e.g. built-up from baffles (in flues or chimneys F23J 13/00)
 - 37/42 • • Applications, arrangements, or dispositions of alarm or automatic safety devices (for feed-water heaters F22D 1/14; alarms responsive to undesired or abnormal conditions G08B)
 - 37/44 • • • of safety valves (safety valves per se F16K)
 - 37/46 • • • responsive to low or high water level, e.g. for checking, suppressing, extinguishing combustion in boilers (fire-fighting, fire extinction in general A62)
 - 37/47 • • • responsive to abnormal temperature, e.g. actuated by fusible plugs (such alarms or devices per se G08B)
 - 37/48 • • Devices or arrangements for removing water, minerals, or sludge from boilers (cleaning water tubes, furnace tubes, or the like of boilers F23J, F28G)
- Note(s)**
- Group F22B 37/48 covers only systems used while the boiler is in operation, or which remain in position while the boiler is in operation, or are specifically adapted to boilers without any other utility.
- 37/50 • • • for draining or expelling water
 - 37/52 • • • Washing-out devices
 - 37/54 • • • De-sludging or blow-down devices
 - 37/56 • • Boiler-cleaning control devices, e.g. for ascertaining proper duration of boiler blow-down
 - 37/58 • • Removing tubes from headers or drums; Extracting tools
 - 37/60 • specially adapted for steam boilers of instantaneous or flash type
 - 37/62 • specially adapted for steam boilers of forced-flow type
 - 37/64 • • Mounting of, or supporting arrangements for, tube units (construction of tube walls of furnaces, e.g. boiler furnaces F23M 5/08)
 - 37/66 • • • involving vertically-disposed water tubes
 - 37/68 • • • involving horizontally-disposed water tubes
 - 37/70 • • Arrangements for distributing water into water tubes
 - 37/72 • • • involving injection devices
 - 37/74 • • • Throttling arrangements for tubes or sets of tubes
 - 37/76 • Adaptations or mounting of devices for observing existence or direction of fluid flow (devices per se G01P)
 - 37/78 • Adaptations or mounting of level indicators (level indicators per se G01F)