

Symbol	Typ	Titel
F	Sektion	MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING
F22	Klasse	STEAM GENERATION (chemical or physical apparatus for generating gases B01J; chemical generation of gas, e.g. under pressure, Section C; removal of combustion products or residues, e.g. cleaning of the combustion contaminated surfaces of tubes of boilers, F23J; generating combustion products of high pressure or high velocity F23R; water heaters not for steam generation F24H , F28; cleaning of internal or external surfaces of heat-transfer conduits, e.g. water tubes of boilers, F28G)
F22B	Unterklasse	METHODS OF STEAM GENERATION; STEAM BOILERS (steam engine plants where engine aspects predominate F01K; 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) <u>General aspects of, or methods for, steam generation</u>
F22B 1/00	Hauptgruppe	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, see the subclasses for such apparatus)
F22B 1/02	1-Punkt Untergruppe	. by exploitation of the heat content of hot heat carriers
F22B 1/04	2-Punkt Untergruppe	... the heat carrier being hot slag, hot residues, or heated blocks, e.g. iron blocks
F22B 1/06	2-Punkt Untergruppe	... the heat carrier being molten; Use of molten metal, e.g. zinc, as heat transfer medium
F22B 1/08	2-Punkt Untergruppe	... the heat carrier being steam
F22B 1/10	3-Punkt Untergruppe	... released from heat accumulators
F22B 1/12	3-Punkt Untergruppe	... produced by an indirect cyclic process
F22B 1/14	3-Punkt Untergruppe	... coming in direct contact with water in bulk or in sprays
F22B 1/16	2-Punkt Untergruppe	... the heat carrier being hot liquid or hot vapour, e.g. waste liquid, waste vapour
F22B 1/18	2-Punkt Untergruppe	... 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)
F22B 1/20	1-Punkt Untergruppe	. using heat evolved in a solution absorbing steam; Soda steam boilers
F22B 1/22	1-Punkt Untergruppe	. using combustion under pressure substantially exceeding atmospheric pressure
F22B 1/24	2-Punkt Untergruppe	... Pressure-fired steam boilers, e.g. using turbo air compressors actuated by hot gases from boiler furnace
F22B 1/26	2-Punkt Untergruppe	... Steam boilers of submerged-flame type, i.e. the flame being surrounded by, or impinging on, the water to be vaporised
F22B 1/28	1-Punkt Untergruppe	. in boilers heated electrically
F22B 1/30	2-Punkt Untergruppe	... Electrode boilers
F22B 3/00	Hauptgruppe	Other methods of steam generation
F22B 3/02	1-Punkt Untergruppe	. involving the use of working media other than water
F22B 3/04	1-Punkt Untergruppe	. by drop in pressure of high-pressure hot water within pressure-reducing chambers, e.g. in accumulators (steam accumulators per se F01K 1/00)
F22B 3/06	1-Punkt Untergruppe	. by transformation of mechanical, e.g. kinetic, energy into heat energy
F22B 3/08	1-Punkt Untergruppe	. at critical or supercritical pressure values

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		<u>Kinds of steam boilers</u>
F22B 5/00	Hauptgruppe	Steam boilers of drum type, i.e. without internal furnace or fire tubes, the boiler body being contacted externally by flue gas
F22B 5/02	1-Punkt Untergruppe	. with auxiliary water tubes outside the boiler body
F22B 5/04	1-Punkt Untergruppe	. Component parts thereof; Accessories therefor (covers or similar closure members for pressure vessels in general F16J 13/00)
F22B 7/00	Hauptgruppe	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
F22B 7/02	1-Punkt Untergruppe	. without auxiliary water tubes
F22B 7/04	1-Punkt Untergruppe	. with auxiliary water tubes
F22B 7/06	2-Punkt Untergruppe	.. inside the furnace tube in transverse arrangement
F22B 7/08	2-Punkt Untergruppe	.. inside the furnace tube in longitudinal arrangement
F22B 7/10	2-Punkt Untergruppe	.. outside the boiler body
F22B 7/12	1-Punkt Untergruppe	. with auxiliary fire tubes; Arrangement of header boxes providing for return diversion of flue gas flow
F22B 7/14	1-Punkt Untergruppe	. with both auxiliary water tubes and auxiliary fire tubes
F22B 7/16	1-Punkt Untergruppe	. Component parts thereof; Accessories therefor, e.g. stay-bolt connections
F22B 7/18	2-Punkt Untergruppe	.. Walling of flues; Flue-gas header boxes
F22B 7/20	2-Punkt Untergruppe	.. Furnace tubes
F22B 9/00	Hauptgruppe	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
F22B 9/02	1-Punkt Untergruppe	. the boiler body being disposed upright, e.g. above the combustion chamber
F22B 9/04	2-Punkt Untergruppe	.. the fire tubes being in upright arrangement
F22B 9/06	3-Punkt Untergruppe	... Arrangement of header boxes providing for return diversion of flue gas flow
F22B 9/08	2-Punkt Untergruppe	.. the fire tubes being in horizontal arrangement
F22B 9/10	1-Punkt Untergruppe	. the boiler body being disposed substantially horizontally, e.g. at the side of the combustion chamber
F22B 9/12	2-Punkt Untergruppe	.. the fire tubes being in substantially-horizontal arrangement
F22B 9/14	3-Punkt Untergruppe	... Arrangement of header boxes providing for return diversion of flue gas flow
F22B 9/16	1-Punkt Untergruppe	. the boiler body containing fire tubes disposed crosswise in inclined upward arrangement
F22B 9/18	1-Punkt Untergruppe	. Component parts thereof; Accessories therefor, e.g. stay-bolt connections
F22B 11/00	Hauptgruppe	Steam boilers of combined fire-tube type and water-tube type, i.e. steam boilers of fire-tube type having auxiliary water tubes
F22B 11/02	1-Punkt Untergruppe	. the fire tubes being in upright arrangement
F22B 11/04	1-Punkt Untergruppe	. the fire tubes being in horizontal arrangement
F22B 13/00	Hauptgruppe	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
F22B 13/02	1-Punkt Untergruppe	. mounted in fixed position with the boiler body disposed upright
F22B 13/04	1-Punkt Untergruppe	. mounted in fixed position with the boiler body disposed substantially horizontally

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F22B 13/06	1-Punkt Untergruppe	. Locomobile, traction-engine, steam-roller, or locomotive boilers
F22B 13/08	2-Punkt Untergruppe	... without auxiliary water tubes inside the fire-box
F22B 13/10	2-Punkt Untergruppe	... with auxiliary water tubes inside the fire-box
F22B 13/12	3-Punkt Untergruppe	... the auxiliary water tubes lining the fire-box
F22B 13/14	1-Punkt Untergruppe	. Component parts thereof; Accessories therefor
F22B 13/16	2-Punkt Untergruppe	... Stay-bolt connections, e.g. rigid connections
F22B 13/18	3-Punkt Untergruppe	... Flexible connections, e.g. of ball-and-socket type
F22B 15/00	Hauptgruppe	Water-tube boilers of horizontal type, i.e. the water-tube sets being arranged horizontally
F22B 17/00	Hauptgruppe	Water-tube boilers of horizontally-inclined type, i.e. the water-tube sets being inclined slightly with respect to the horizontal plane
F22B 17/02	1-Punkt Untergruppe	. built-up from water-tube sets in abutting connection with two header boxes in common for all sets, e.g. with flat header boxes
F22B 17/04	2-Punkt Untergruppe	... the water-tube sets being inclined in opposite directions, e.g. crosswise
F22B 17/06	2-Punkt Untergruppe	... the water-tube sets being bent angularly
F22B 17/08	2-Punkt Untergruppe	... the water-tube sets being curved
F22B 17/10	1-Punkt Untergruppe	. 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
F22B 17/12	2-Punkt Untergruppe	... the sectional headers being in vertical or substantially-vertical arrangement
F22B 17/14	2-Punkt Untergruppe	... the sectional headers being in horizontal or substantially-horizontal arrangement
F22B 17/16	1-Punkt Untergruppe	. Component parts thereof; Accessories therefor
F22B 17/18	2-Punkt Untergruppe	... Header boxes; Sectional headers
F22B 19/00	Hauptgruppe	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
F22B 21/00	Hauptgruppe	Water-tube boilers of vertical or steeply-inclined type, i.e. the water-tube sets being arranged vertically or substantially vertically
F22B 21/02	1-Punkt Untergruppe	. built-up from substantially-straight water tubes
F22B 21/04	2-Punkt Untergruppe	... involving a single upper drum and a single lower drum, e.g. the drums being arranged transversely
F22B 21/06	3-Punkt Untergruppe	... the water tubes being arranged annularly in sets, e.g. in abutting connection with drums of annular shape
F22B 21/08	3-Punkt Untergruppe	... the water tubes being arranged sectionally in groups or in banks, e.g. bent over at their ends
F22B 21/10	3-Punkt Untergruppe	... the water tubes being arranged in staggered rows
F22B 21/12	2-Punkt Untergruppe	... 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
F22B 21/14	2-Punkt Untergruppe	... involving a single upper drum and two or more lower drums
F22B 21/16	3-Punkt Untergruppe	... the lower drums being interconnected by further water tubes
F22B 21/18	2-Punkt Untergruppe	... involving two or more upper drums and a single lower drum
F22B 21/20	2-Punkt Untergruppe	... involving sectional or subdivided headers in separate arrangement for each water-tube set

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F22B 21/22	1-Punkt Untergruppe	. built-up from water tubes of form other than straight or substantially straight
F22B 21/24	2-Punkt Untergruppe	... bent in serpentine or sinuous form
F22B 21/26	2-Punkt Untergruppe	... bent helically, i.e. coiled
F22B 21/28	2-Punkt Untergruppe	... bent spirally
F22B 21/30	2-Punkt Untergruppe	... bent in U-loop form
F22B 21/32	3-Punkt Untergruppe	... disposed horizontally in abutting connection with upright headers or rising water mains
F22B 21/34	1-Punkt Untergruppe	. built-up from water tubes grouped in panel form surrounding the combustion chamber, i.e. radiation boilers
F22B 21/36	2-Punkt Untergruppe	... involving an upper drum or headers mounted at the top of the combustion chamber
F22B 21/38	2-Punkt Untergruppe	... Component parts thereof, e.g. prefabricated panels
F22B 21/40	1-Punkt Untergruppe	. built-up from water tubes arranged in a comparatively long vertical shaft, i.e. tower boilers
F22B 23/00	Hauptgruppe	Water-tube boilers built-up from sets of spaced double-walled water tubes of return type in unilaterial abutting connection with a boiler drum or with a header box, i.e. built-up from Field water tubes comprising an inner tube arranged within an outer unilaterally-closed tube
F22B 23/02	1-Punkt Untergruppe	. the water-tube, i.e. Field-tube, sets being horizontal or substantially horizontal
F22B 23/04	1-Punkt Untergruppe	. the water-tube, i.e. Field-tube, sets being vertical or substantially vertical
F22B 23/06	1-Punkt Untergruppe	. Component parts thereof, e.g. Field water tubes (heat-exchange tubes in general F28F)
F22B 25/00	Hauptgruppe	Water-tube boilers built-up from sets of water tubes with internally-arranged flue tubes, or fire tubes, extending through the water tubes
F22B 27/00	Hauptgruppe	Instantaneous or flash steam boilers
F22B 27/02	1-Punkt Untergruppe	. built-up from fire tubes
F22B 27/04	1-Punkt Untergruppe	. built-up from water tubes (F22B 27/12 to F22B 27/16 take precedence)
F22B 27/06	2-Punkt Untergruppe	... bent in serpentine or sinuous form
F22B 27/08	2-Punkt Untergruppe	... bent helically, i.e. coiled
F22B 27/10	2-Punkt Untergruppe	... bent spirally
F22B 27/12	1-Punkt Untergruppe	. built-up from rotary heat-exchange elements, e.g. from tube assemblies
F22B 27/14	1-Punkt Untergruppe	. built-up from heat-exchange elements arranged within a confined chamber having heat-retaining walls
F22B 27/16	1-Punkt Untergruppe	. involving spray nozzles for sprinkling or injecting water particles on to or into hot heat-exchange elements, e.g. into tubes
F22B 29/00	Hauptgruppe	Steam boilers of forced-flow type
F22B 29/02	1-Punkt Untergruppe	. of forced-circulation type
F22B 29/04	1-Punkt Untergruppe	. of combined-circulation type, i.e. in which convection circulation due to the difference in specific gravity between cold and hot water is promoted by additional measures, e.g. by injecting pressure-water temporarily
F22B 29/06	1-Punkt Untergruppe	. of once-through type, i.e. built-up from tubes receiving water at one end and delivering superheated steam at the other end of the tubes (F22B 33/00 takes precedence)
F22B 29/08	2-Punkt Untergruppe	... operating with fixed point of final state of complete evaporation
F22B 29/10	2-Punkt Untergruppe	... operating with sliding point of final state of complete evaporation

Symbol	Typ	Titel
F22B 29/12	2-Punkt Untergruppe	... operating with superimposed recirculation during starting and low-load periods, e.g. composite boilers
F22B 31/00	Hauptgruppe	Modifications of boiler construction, or of tube systems, dependent on installation of combustion apparatus; Arrangements or dispositions of combustion apparatus (steam generation characterised by heating method F22B 1/00; combustion apparatus per se F23)
F22B 31/02	1-Punkt Untergruppe	. Installation of water-tube boilers in chimneys, e.g. in converter chimneys
F22B 31/04	1-Punkt Untergruppe	. Heat supply by installation of two or more combustion apparatus, e.g. of separate combustion apparatus for the boiler and the superheater respectively
F22B 31/06	2-Punkt Untergruppe	... Installation of emergency heat supply
F22B 31/08	1-Punkt Untergruppe	. Installation of heat-exchange apparatus or of means in boilers for heating air supplied for combustion <u>Steam-generation plants; Control systems</u>
F22B 33/00	Hauptgruppe	Steam-generation plants, e.g. comprising steam boilers of different types in mutual association (arrangements or dispositions of steam-generation plants in marine vessels B63H 21/00)
F22B 33/02	1-Punkt Untergruppe	. Combinations of boilers having a single combustion apparatus in common
F22B 33/04	2-Punkt Untergruppe	... of boilers of furnace-tube type with boilers of water-tube type
F22B 33/06	2-Punkt Untergruppe	... of boilers of furnace-tube type with boilers of fire-tube type
F22B 33/08	2-Punkt Untergruppe	... of boilers of water-tube type with boilers of fire-tube type
F22B 33/10	2-Punkt Untergruppe	... of two or more superposed boilers with separate water volumes and operating with two or more separate water levels
F22B 33/12	1-Punkt Untergruppe	. Self-contained steam boilers, i.e. comprising as a unit the steam boiler, the combustion apparatus, the fuel storage, accessory machines, and equipment
F22B 33/14	1-Punkt Untergruppe	. Combinations of low- and high-pressure boilers
F22B 33/16	2-Punkt Untergruppe	... of forced-flow type
F22B 33/18	1-Punkt Untergruppe	. Combinations of steam boilers with other apparatus
F22B 35/00	Hauptgruppe	Control systems for steam boilers (regulation or control of steam power plants F01K 7/00; for regulating feed-water supply F22D; for controlling superheat temperature F22G 5/00; control of combustion F23N)
F22B 35/02	1-Punkt Untergruppe	. for steam boilers with natural convection circulation
F22B 35/04	2-Punkt Untergruppe	... during starting-up periods, i.e. during the periods between the lighting of the furnaces and the attainment of the normal operating temperature of the steam boilers
F22B 35/06	1-Punkt Untergruppe	. for steam boilers of forced-flow type
F22B 35/08	2-Punkt Untergruppe	... of forced-circulation type
F22B 35/10	2-Punkt Untergruppe	... of once-through type
F22B 35/12	3-Punkt Untergruppe	... operating at critical or supercritical pressure
F22B 35/14	2-Punkt Untergruppe	... during the starting-up periods, i.e. during the periods between the lighting of the furnaces and the attainment of the normal operating temperature of the steam boilers
F22B 35/16	2-Punkt Untergruppe	... responsive to the percentage of steam in the mixture of steam and water
F22B 35/18	1-Punkt Untergruppe	. Applications of computers to steam-boiler control
F22B 37/00	Hauptgruppe	Component parts or details of steam boilers (venting devices F16K 24/00; steam traps or like apparatus F16T)

Symbol	Typ	Titel
F22B 37/02	1-Punkt Untergruppe	. applicable to more than one kind or type of steam boiler
F22B 37/04	2-Punkt Untergruppe	... and characterised by material, e.g. use of special steel alloy
F22B 37/06	2-Punkt Untergruppe	... Flue or fire tubes; Accessories therefor, e.g. fire-tube inserts
F22B 37/08	3-Punkt Untergruppe	... Fittings preventing burning-off of the tube edges
F22B 37/10	2-Punkt Untergruppe	... Water tubes; Accessories therefor (working of metal tubes B21D; pipes in general F16L; repairing leaks in water tubes F16L 55/16 , F28F 11/00; cleaning water tubes of boilers F23J , F28G; baffles, screens, or deflectors formed of water tubes F23M 9/10)
F22B 37/12	3-Punkt Untergruppe	... Forms of water tubes, e.g. of varying cross-section
F22B 37/14	3-Punkt Untergruppe	... Supply mains, e.g. rising mains, down-comers, in connection with water tubes
F22B 37/16	3-Punkt Untergruppe	... Return bends
F22B 37/18	3-Punkt Untergruppe	... Inserts, e.g. for receiving deposits from water
F22B 37/20	3-Punkt Untergruppe	... Supporting arrangements, e.g. for securing water-tube sets (construction of tube walls of furnaces including boiler furnaces F23M 5/08)
F22B 37/22	2-Punkt Untergruppe	... 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)
F22B 37/24	2-Punkt Untergruppe	... Supporting, suspending, or setting arrangements, e.g. heat shielding (frames, engine beds F16M)
F22B 37/26	2-Punkt Untergruppe	... Steam-separating arrangements (vapour-liquid separators, e.g. for drying steam, B01D , B04)
F22B 37/28	3-Punkt Untergruppe	... involving reversal of direction of flow
F22B 37/30	3-Punkt Untergruppe	... using impingement against baffle separators
F22B 37/32	3-Punkt Untergruppe	... using centrifugal force
F22B 37/34	2-Punkt Untergruppe	... Adaptations of boilers for promoting water circulation (auxiliary apparatus F22D 7/00)
F22B 37/36	2-Punkt Untergruppe	... Arrangements for sheathing or casing boilers
F22B 37/38	2-Punkt Untergruppe	... 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)
F22B 37/40	2-Punkt Untergruppe	... Arrangements of partition walls in flues of steam boilers, e.g. built-up from baffles (in flues or chimneys F23J 13/00)
F22B 37/42	2-Punkt Untergruppe	... 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)
F22B 37/44	3-Punkt Untergruppe	... of safety valves (safety valves per se F16K)
F22B 37/46	3-Punkt Untergruppe	... responsive to low or high water level, e.g. for checking, suppressing, extinguishing combustion in boilers (fire-fighting, fire extinction in general A62)
F22B 37/47	3-Punkt Untergruppe	... responsive to abnormal temperature, e.g. actuated by fusible plugs (such alarms or devices per se G08B)
F22B 37/48	2-Punkt Untergruppe	... Devices or arrangements for removing water, minerals, or sludge from boilers (cleaning water tubes, furnace tubes, or the like of boilers F23J , F28G)
F22B 37/50	3-Punkt Untergruppe	... for draining or expelling water
F22B 37/52	3-Punkt Untergruppe	... Washing-out devices
F22B 37/54	3-Punkt Untergruppe	... De-sludging or blow-down devices

Symbol	Typ	Titel
F22B 37/56	2-Punkt Untergruppe	... Boiler-cleaning control devices, e.g. for ascertaining proper duration of boiler blow-down
F22B 37/58	2-Punkt Untergruppe	... Removing tubes from headers or drums; Extracting tools
F22B 37/60	1-Punkt Untergruppe	. specially adapted for steam boilers of instantaneous or flash type
F22B 37/62	1-Punkt Untergruppe	. specially adapted for steam boilers of forced-flow type
F22B 37/64	2-Punkt Untergruppe	... Mounting of, or supporting arrangements for, tube units (construction of tube walls of furnaces, e.g. boiler furnaces F23M 5/08)
F22B 37/66	3-Punkt Untergruppe	... involving vertically-disposed water tubes
F22B 37/68	3-Punkt Untergruppe	... involving horizontally-disposed water tubes
F22B 37/70	2-Punkt Untergruppe	... Arrangements for distributing water into water tubes
F22B 37/72	3-Punkt Untergruppe	... involving injection devices
F22B 37/74	3-Punkt Untergruppe	... Throttling arrangements for tubes or sets of tubes
F22B 37/76	1-Punkt Untergruppe	. Adaptations or mounting of devices for observing existence or direction of fluid flow (devices per se G01P)
F22B 37/78	1-Punkt Untergruppe	. Adaptations or mounting of level indicators (level indicators per se G01F)