

F22 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)

F22D PREHEATING, OR ACCUMULATING PREHEATED, FEED-WATER; FEED-WATER SUPPLY; CONTROLLING WATER LEVEL; CIRCULATING WATER WITHIN BOILERS (chemical treatment of water, e.g. purification, C02F; enclosed heat-exchange apparatus in general F28D; controlling in general G05)

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| 1/00 Feed-water heaters, e.g. preheaters | 3/06 . directly connected to boilers |
| 1/02 . with water tubes arranged in the boiler furnace, fire tubes, or flue ways (heat-exchange tubes in general F28F) | 3/08 . specially adapted for locomotives (locomotive boilers F22B 13/06) |
| 1/04 . . the tubes having plain outer surfaces, e.g. in vertical arrangement | 3/10 . . Control devices (controlling water feed to boilers, or water level F22D 5/00) |
| 1/06 . . . in horizontal arrangement | 5/00 Controlling water feed or water level; Automatic water feeding or water-level regulators (steam traps F16T; measuring or indicating instruments G01; for indicating water level G01F; level control in general G05D 9/00) |
| 1/08 . . the tubes having fins, ribs, gills, corrugations, or the like on their outer surfaces, e.g. in vertical arrangement | 5/02 . with an intermediate compartment from which the water is fed by gravity after mechanically moving the compartment, the movement being controlled according to water level |
| 1/10 . . . in horizontal arrangement (hollow fire-bars, grates, or the like used as water tubes F23H 3/02) | 5/04 . with pivoting buckets |
| 1/12 . . Control devices, e.g. for regulating steam temperature | 5/06 . with receptacles external to, but in free communication with, the boilers and adapted to move up and down in accordance with change in water level |
| 1/14 . . Safety or venting devices (safety devices for boilers in general F22B 37/42) | 5/08 . with float-actuated valves |
| 1/16 . with water tubes arranged otherwise than in the boiler furnace, fire tubes, or flue ways | 5/10 . . and with pistons or membranes unitary with the feed inlet valves |
| 1/18 . . and heated indirectly | 5/12 . . and with dipping tubes |
| 1/20 . . and directly connected to boilers | 5/14 . responsive to thermal expansion and contraction, e.g. of solid elements |
| 1/22 . . and provided for rotary movement | 5/16 . . of fluids |
| 1/24 . with fire tubes or flue ways traversing feed-water vessels | 5/18 . for varying the speed or delivery pressure of feed pumps |
| 1/26 . with means, other than tubes, to separate water and heating medium, e.g. bulk heaters without internal flues or tubes, jacketed smoke-boxes or flues | 5/20 . . without floats |
| 1/28 . for direct heat transfer, e.g. by mixing water and steam | 5/22 . . with floats |
| 1/30 . . with stages, steps, baffles, dishes, circular troughs, or other means to cause interrupted or cascading fall of water | 5/24 . with electric switches |
| 1/32 . arranged to be heated by steam, e.g. bled from turbines | 5/26 . Automatic feed-control systems (automatic safety devices F22B 37/42; controlling in general G05) |
| 1/34 . . and returning condensate to boiler with main feed supply | 5/28 . . responsive to amount of steam withdrawn; responsive to steam pressure |
| 1/36 . Water and air preheating systems | 5/30 . . responsive to both water level and amount of steam withdrawn or steam pressure |
| 1/38 . . Constructional features of water and air preheating systems | 5/32 . . influencing the speed or delivery pressure of the feed pumps |
| 1/40 . Combinations of exhaust-steam and smoke-gas preheaters (for locomotives F22D 1/42) | 5/34 . . Applications of valves (valves <u>per se</u> F16K) |
| 1/42 . specially adapted for locomotives | 5/36 . . for feeding a number of steam boilers designed for different ranges of temperature and pressure |
| 1/44 . . Smoke-gas preheaters | 7/00 Auxiliary devices or apparatus for promoting water circulation |
| 1/46 . . Exhaust-steam preheaters | 7/02 . Saddles or like directing plates fitted to furnace tubes |
| 1/48 . . Details | 7/04 . Injectors for water or steam |
| 1/50 . incorporating thermal de-aeration of feed-water (de-aeration produced in the course of direct heat transfer F22D 1/28; thermal de-aeration of water <u>per se</u> B01D 19/00, C02F 1/20; valves for venting F16K 24/04) [3] | 7/06 . Rotary devices, e.g. propellers |
| 3/00 Accumulators for preheated water | 7/08 . . Arrangements of pumps, e.g. outside the boilers |
| 3/02 . arranged within combustion chambers | 7/10 . . . within the boilers |
| 3/04 . combined with steam accumulators | 7/12 . Control devices |
| | 7/14 . specially adapted for locomotive boilers |

F22D

- 11/00

Feed-water supply not provided for in other main groups

11/02

· Arrangements of feed-water pumps (F22D 11/06 takes precedence; pumps per se F04)
- 11/04

· · with means to eliminate steam formation

11/06

· · for returning condensate to boiler