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

F22 STEAM GENERATION

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

1/00 Feed-water heaters, e.g. preheaters [1, 2006.01]
1/02 • with water tubes arranged in the boiler furnace, fire tubes, or flue ways (heat-exchange tubes in general F28F) **[1, 2006.01]**
1/04 • • the tubes having plain outer surfaces, e.g. in vertical arrangement **[1, 2006.01]**
1/06 • • • in horizontal arrangement **[1, 2006.01]**
1/08 • • the tubes having fins, ribs, gills, corrugations, or the like on their outer surfaces, e.g. in vertical arrangement **[1, 2006.01]**
1/10 • • • in horizontal arrangement (hollow fire-bars, grates, or the like used as water tubes F23H 3/02) **[1, 2006.01]**
1/12 • • Control devices, e.g. for regulating steam temperature **[1, 2006.01]**
1/14 • • Safety or venting devices (safety devices for boilers in general F22B 37/42) **[1, 2006.01]**
1/16 • with water tubes arranged otherwise than in the boiler furnace, fire tubes, or flue ways **[1, 2006.01]**
1/18 • • and heated indirectly **[1, 2006.01]**
1/20 • • and directly connected to boilers **[1, 2006.01]**
1/22 • • and provided for rotary movement **[1, 2006.01]**
1/24 • with fire tubes or flue ways traversing feed-water vessels **[1, 2006.01]**
1/26 • with means, other than tubes, to separate water and heating medium, e.g. bulk heaters without internal flues or tubes, jacketted smoke-boxes or flues **[1, 2006.01]**
1/28 • for direct heat transfer, e.g. by mixing water and steam **[1, 2006.01]**
1/30 • • with stages, steps, baffles, dishes, circular troughs, or other means to cause interrupted or cascading fall of water **[1, 2006.01]**
1/32 • arranged to be heated by steam, e.g. bled from turbines **[1, 2006.01]**
1/34 • • and returning condensate to boiler with main feed supply **[1, 2006.01]**
1/36 • Water and air preheating systems **[1, 2006.01]**
1/38 • • Constructional features of water and air preheating systems **[1, 2006.01]**
1/40 • Combinations of exhaust-steam and smoke-gas preheaters (for locomotives F22D 1/42) **[1, 2006.01]**
1/42 • specially adapted for locomotives **[1, 2006.01]**
1/44 • • Smoke-gas preheaters **[1, 2006.01]**
1/46 • • Exhaust-steam preheaters **[1, 2006.01]**
1/48 • • Details **[1, 2006.01]**
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 per se B01D 19/00, C02F 1/20; valves for venting F16K 24/04) **[3, 2006.01]**

3/00 Accumulators for preheated water [1, 2006.01]
3/02 • arranged within combustion chambers **[1, 2006.01]**
3/04 • combined with steam accumulators **[1, 2006.01]**
3/06 • directly connected to boilers **[1, 2006.01]**
3/08 • specially adapted for locomotives (locomotive boilers F22B 13/06) **[1, 2006.01]**
3/10 • • Control devices (controlling water feed to boilers, or water level F22D 5/00) **[1, 2006.01]**

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, 2006.01]**
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, 2006.01]**
5/04 • with pivoting buckets **[1, 2006.01]**
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, 2006.01]**
5/08 • with float-actuated valves **[1, 2006.01]**
5/10 • • and with pistons or membranes unitary with the feed inlet valves **[1, 2006.01]**
5/12 • • and with dipping tubes **[1, 2006.01]**
5/14 • responsive to thermal expansion and contraction, e.g. of solid elements **[1, 2006.01]**
5/16 • • of fluids **[1, 2006.01]**
5/18 • for varying the speed or delivery pressure of feed pumps **[1, 2006.01]**
5/20 • • without floats **[1, 2006.01]**
5/22 • • with floats **[1, 2006.01]**
5/24 • with electric switches **[1, 2006.01]**
5/26 • Automatic feed-control systems (automatic safety devices F22B 37/42; controlling in general G05) **[1, 2006.01]**
5/28 • • responsive to amount of steam withdrawn; responsive to steam pressure **[1, 2006.01]**
5/30 • • responsive to both water level and amount of steam withdrawn or steam pressure **[1, 2006.01]**
5/32 • • influencing the speed or delivery pressure of the feed pumps **[1, 2006.01]**

5/34 • • Applications of valves (valves per se F16K) **[1, 2006.01]**

5/36 • • for feeding a number of steam boilers designed for different ranges of temperature and pressure **[1, 2006.01]**

7/00 Auxiliary devices for promoting water circulation (adaptation of boilers for promoting water circulation F22B 37/34) **[1, 2006.01]**

7/02 • Saddles or like directing plates fitted to furnace tubes **[1, 2006.01]**

7/04 • Injectors for water or steam **[1, 2006.01]**

7/06 • Rotary devices, e.g. propellers **[1, 2006.01]**

7/08 • • Arrangements of pumps, e.g. outside the boilers **[1, 2006.01]**

7/10 • • • within the boilers **[1, 2006.01]**

7/12 • Control devices **[1, 2006.01]**

7/14 • specially adapted for locomotive boilers **[1, 2006.01]**

11/00 Feed-water supply not provided for in other main groups [1, 2006.01]

11/02 • Arrangements of feed-water pumps (F22D 11/06 takes precedence; pumps per se F04) **[1, 2006.01]**

11/04 • • with means to eliminate steam formation **[1, 2006.01]**

11/06 • • for returning condensate to boiler **[1, 2006.01]**