

CPC COOPERATIVE PATENT CLASSIFICATION

F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

LIGHTING; HEATING

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](#))

(NOTE omitted)

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](#))

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|-------------|--|-------------|--|
| 1/00 | Feed-water heaters, i.e. economisers or like preheaters | 1/30 | . . with stages, steps, baffles, dishes, circular troughs, or other means to cause interrupted or cascading fall of water (de-aeration apparatus C02F) |
| 1/003 | . { Feed-water heater systems (F22D 1/325, F22D 1/36 and F22D 1/40 take precedence) } | 1/32 | . arranged to be heated by steam, e.g. bled from turbines |
| 1/006 | . { with heating tubes (F22D 1/24 takes precedence) } | 1/325 | . . { Schematic arrangements or control devices therefor } |
| 1/02 | . with water tubes arranged in the boiler furnace, fire tubes, or flue ways (heat-exchange tubes in general F28F) | 1/34 | . . and returning condensate to boiler with main feed supply |
| 1/04 | . . the tubes having plain outer surfaces, e.g. in vertical arrangement | 1/36 | . Water and air preheating systems |
| 1/06 | . . . in horizontal arrangement | 1/38 | . . Constructional features of water and air preheating systems |
| 1/08 | . . the tubes having fins, ribs, gills, corrugations, or the like on their outer surfaces, e.g. in vertical arrangement | 1/40 | . Combinations of exhaust-steam and smoke-gas preheaters (for locomotives F22D 1/42) |
| 1/10 | . . . in horizontal arrangement (hollow fire-bars, grates, or the like used as water tubes F23H 3/02) | 1/42 | . specially adapted for locomotives |
| 1/12 | . . Control devices, e.g. for regulating steam temperature | 1/44 | . . Smoke-gas preheaters |
| 1/14 | . . Safety or venting devices (safety devices for boilers in general F22B 37/42) | 1/46 | . . Exhaust-steam preheaters |
| 1/16 | . with water tubes arranged otherwise than in the boiler furnace, fire tubes, or flue ways | 1/48 | . . Details |
| 1/18 | . . and heated indirectly | 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) |
| 1/20 | . . and directly connected to boilers | 3/00 | Accumulators for preheated water |
| 1/22 | . . and provided for rotary movements | 3/02 | . arranged within combustion chambers |
| 1/24 | . with fire tubes or flue ways traversing feed-water vessels | 3/04 | . combined with steam accumulators |
| 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 flue or flues | 3/06 | . directly connected to boilers |
| 1/28 | . for direct heat transfer, e.g. by mixing water and steam | 3/08 | . specially adapted for locomotives (locomotives boilers F22B 13/06) |
| | | 3/10 | . . Control devices (controlling water feed to boilers, or water level F22D 5/00) |

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](#))

- 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
- 5/04 . with pivoting buckets
- 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
- 5/08 . with float-actuated valves
- 5/10 . . and with pistons or membranes unitary with the feed inlet valves
- 5/12 . . and with dipping tubes
- 5/14 . responsive to thermal expansion and contraction, e.g. of solid elements
- 5/16 . . of fluids
- 5/18 . for varying the speed or delivery pressure of feed pumps
- 5/20 . . without floats
- 5/22 . . with floats
- 5/24 . with electric switches
- 5/26 . Automatic feed-control systems ([automatic safety devices F22B 37/42](#); [controlling in general G05](#))
- 5/28 . . responsive to amount of steam withdrawn; responsive to steam pressure
- 5/30 . . responsive to both water level and amount of steam withdrawn or steam pressure
- 5/32 . . influencing the speed or delivery pressure of the feed pumps
- 5/34 . . Applications of valves ([valves per se F16K](#))
- 5/36 . . for feeding a number of steam boilers designed for different ranges of temperature and pressure

7/00 Auxiliary devices for promoting water circulation ([adaptation of boilers for promoting water circulation F22B 37/34](#))

- 7/02 . Saddles or like directing plates fitted to furnace tubes
- 7/04 . Injectors for water or steam
- 7/06 . Rotary devices, e.g. propellers
- 7/08 . . Arrangements of pumps, e.g. outside the boilers
- 7/10 . . . within the boilers
- 7/12 . Control devices
- 7/14 . specially adapted for locomotive boilers

11/00 Feed-water supply not provided for in other main groups

- 11/003 . {[Emergency feed-water supply \(safety devices for boilers in general F22B 37/42\)](#)}
- 11/006 . {[Arrangements of feedwater cleaning with a boiler](#)}
- 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