

**CPC****COOPERATIVE PATENT CLASSIFICATION****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](#))

**F22D 1/00**

**Feed-water heaters, i.e. economisers or like preheaters**

## F22D 1/003

- . {[Feed-water heater systems \(F22D 1/325, F22D 1/36 and F22D 1/40 take precedence\)](#)}

## F22D 1/006

- . {[with heating tubes \(F22D 1/24 takes precedence\)](#)}

## F22D 1/02

- . with water tubes arranged in the boiler furnace, fire tubes, or flue ways ([heat-exchange tubes in general F28F](#))

## F22D 1/04

- .. the tubes having plain outer surfaces, e.g. in vertical arrangement

## F22D 1/06

- ... in horizontal arrangement

## F22D 1/08

- .. the tubes having fins, ribs, gills, corrugations, or the like on their outer surfaces, e.g. in vertical arrangement

## F22D 1/10

- ... in horizontal arrangement ([hollow fire-bars, grates, or the like used as water tubes F23H 3/02](#))

## F22D 1/12

- .. Control devices, e.g. for regulating steam temperature

## F22D 1/14

- .. Safety or venting devices ([safety devices for boilers in general F22B 37/42](#))

## F22D 1/16

- . with water tubes arranged otherwise than in the boiler furnace, fire tubes, or flue ways

## F22D 1/18

- .. and heated indirectly

## F22D 1/20

- .. and directly connected to boilers

## F22D 1/22

- .. and provided for rotary movements

## F22D 1/24

- . with fire tubes or flue ways traversing feed-water vessels

## F22D 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

## F22D 1/28

- . for direct heat transfer, e.g. by mixing water and steam

## F22D 1/30

- .. with stages, steps, baffles, dishes, circular troughs, or other means to cause interrupted or cascading fall of water ([de-aeration apparatus C02F](#))

## F22D 1/32

- . arranged to be heated by steam, e.g. bled from turbines

## F22D 1/325

- .. {[Schematic arrangements or control devices therefor](#)}

## F22D 1/34

- .. and returning condensate to boiler with main feed supply

## F22D 1/36

- . Water and air preheating systems

- F22D 1/38 . . Constructional features of water and air preheating systems
- F22D 1/40 . Combinations of exhaust-steam and smoke-gas preheaters ([for locomotives F22D 1/42](#))
- F22D 1/42 . specially adapted for locomotives
- F22D 1/44 . . Smoke-gas preheaters
- F22D 1/46 . . Exhaust-steam preheaters
- F22D 1/48 . . Details
- F22D 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](#))
- F22D 3/00                    Accumulators for preheated water**
- F22D 3/02 . arranged within combustion chambers
- F22D 3/04 . combined with steam accumulators
- F22D 3/06 . directly connected to boilers
- F22D 3/08 . specially adapted for locomotives ([locomotives boilers F22B 13/06](#))
- F22D 3/10 . . Control devices ([controlling water feed to boilers, or water level F22D 5/00](#))
- F22D 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](#))
- F22D 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
- F22D 5/04 . with pivoting buckets
- F22D 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
- F22D 5/08 . with float-actuated valves
- F22D 5/10 . . and with pistons or membranes unitary with the feed inlet valves
- F22D 5/12 . . and with dipping tubes
- F22D 5/14 . responsive to thermal expansion and contraction, e.g. of solid elements
- F22D 5/16 . . of fluids
- F22D 5/18 . for varying the speed or delivery pressure of feed pumps
- F22D 5/20 . . without floats

- F22D 5/22 . . with floats
- F22D 5/24 . with electric switches
- F22D 5/26 . Automatic feed-control systems ([automatic safety devices F22B 37/42](#); [controlling in general G05](#))
- F22D 5/28 . . responsive to amount of steam withdrawn; responsive to steam pressure
- F22D 5/30 . . responsive to both water level and amount of steam withdrawn or steam pressure
- F22D 5/32 . . influencing the speed or delivery pressure of the feed pumps
- F22D 5/34 . . Applications of valves ([valves per se F16K](#))
- F22D 5/36 . . for feeding a number of steam boilers designed for different ranges of temperature and pressure
  
- F22D 7/00** **Auxiliary devices for promoting water circulation** ([adaptation of boilers for promoting water circulation F22B 37/34](#))
- F22D 7/02 . Saddles or like directing plates fitted to furnace tubes
- F22D 7/04 . Injectors for water or steam
- F22D 7/06 . Rotary devices, e.g. propellers
- F22D 7/08 . . Arrangements of pumps, e.g. outside the boilers
- F22D 7/10 . . . within the boilers
- F22D 7/12 . Control devices
- F22D 7/14 . specially adapted for locomotive boilers
  
- F22D 11/00** **Feed-water supply not provided for in other main groups**
- F22D 11/003 . {[Emergency feed-water supply \(safety devices for boilers in general F22B 37/42\)](#)}
- F22D 11/006 . {[Arrangements of feedwater cleaning with a boiler](#)}
- F22D 11/02 . Arrangements of feed-water pumps ([F22D 11/06 takes precedence](#); [pumps per se F04](#))
- F22D 11/04 . . with means to eliminate steam formation
- F22D 11/06 . . for returning condensate to boiler