

**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