

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