

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