

**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 <a href="#">F22D 1/28</a> ; thermal de-aeration of water per se <a href="#">B01D 19/00</a> , <a href="#">C02F 1/20</a> ; valves for venting <a href="#">F16K 24/04</a> )
<b>F22D 3/00</b>	<b>Accumulators for preheated water</b>
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 <a href="#">F22B 13/06</a> )
F22D 3/10	.. Control devices (controlling water feed to boilers, or water level <a href="#">F22D 5/00</a> )
<b>F22D 5/00</b>	<b>Controlling water feed or water level; Automatic water feeding or water-level regulators</b> (steam traps <a href="#">F16T</a> ; measuring or indicating instruments <a href="#">G01</a> ; for indicating water level <a href="#">G01F</a> ; level control in general <a href="#">G05D 9/00</a> )
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 <a href="#">F22B 37/42</a> ; controlling in general <a href="#">G05</a> )
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 <a href="#">F16K</a> )
F22D 5/36	.. for feeding a number of steam boilers designed for different ranges of temperature and pressure
<b>F22D 7/00</b>	<b>Auxiliary devices for promoting water circulation</b> (adaptation of boilers for promoting water circulation <a href="#">F22B 37/34</a> )
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