

# CPC COOPERATIVE PATENT CLASSIFICATION

## F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

### LIGHTING; HEATING

## F22 STEAM GENERATION (NOTE omitted)

## F22D PREHEATING, OR ACCUMULATING PREHEATED, FEED-WATER FOR STEAM GENERATION; FEED-WATER SUPPLY FOR STEAM GENERATION; CONTROLLING WATER LEVEL FOR STEAM GENERATION; AUXILIARY DEVICES FOR PROMOTING WATER CIRCULATION WITHIN STEAM BOILERS

### WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

|             |  |              |  |
|-------------|--|--------------|--|
| <b>1/00</b> | <b>Feed-water heaters, i.e. economisers or like preheaters</b>   | <b>1/325</b> | <b>. . {Schematic arrangements or control devices therefor}</b>  |
| 1/003       | . {Feed-water heater systems ( <a href="#">F22D 1/325</a> , <a href="#">F22D 1/36</a> and <a href="#">F22D 1/40</a> take precedence)}                                    | 1/34         | . . and returning condensate to boiler with main feed supply   |
| 1/006       | . {with heating tubes ( <a href="#">F22D 1/24</a> takes precedence)}   | 1/36         | . Water and air preheating systems   |
| 1/02        | . with water tubes arranged in the boiler furnace, fire tubes, or flue ways ( <a href="#">heat-exchange tubes in general F28F</a> )                                      | 1/38         | . . Constructional features of water and air preheating systems  |
| 1/04        | . . the tubes having plain outer surfaces, e.g. in vertical arrangement  | 1/40         | . Combinations of exhaust-steam and smoke-gas preheaters ( <a href="#">for locomotives F22D 1/42</a> )   |
| 1/06        | . . . in horizontal arrangement  | 1/42         | . specially adapted for locomotives  |
| 1/08        | . . the tubes having fins, ribs, gills, corrugations, or the like on their outer surfaces, e.g. in vertical arrangement  | 1/44         | . . Smoke-gas preheaters   |
| 1/10        | . . . in horizontal arrangement ( <a href="#">hollow fire-bars, grates, or the like used as water tubes F23H 3/02</a> )  | 1/46         | . . Exhaust-steam preheaters   |
| 1/12        | . . Control devices, e.g. for regulating steam temperature   | 1/48         | . . Details  |
| 1/14        | . . Safety or venting devices ( <a href="#">safety devices for boilers in general F22B 37/42</a> )   | 1/50         | . incorporating thermal de-aeration of feed-water ( <a href="#">de-aeration produced in the course of direct heat transfer F22D 1/28</a> ; <a href="#">thermal de-aeration of water per se B01D 19/00</a> , <a href="#">C02F 1/20</a> ; <a href="#">valves for venting F16K 24/04</a> )          |
| 1/16        | . with water tubes arranged otherwise than in the boiler furnace, fire tubes, or flue ways   | <b>3/00</b>  | <b>Accumulators for preheated water</b>  |
| 1/18        | . . and heated indirectly  | 3/02         | . arranged within combustion chambers  |
| 1/20        | . . and directly connected to boilers  | 3/04         | . combined with steam accumulators   |
| 1/22        | . . and provided for rotary movements  | 3/06         | . directly connected to boilers  |
| 1/24        | . with fire tubes or flue ways traversing feed-water vessels   | 3/08         | . specially adapted for locomotives ( <a href="#">locomotives boilers F22B 13/06</a> )   |
| 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           | 3/10         | . . Control devices ( <a href="#">controlling water feed to boilers, or water level F22D 5/00</a> )  |
| 1/28        | . for direct heat transfer, e.g. by mixing water and steam   | <b>5/00</b>  | <b>Controlling water feed or water level; Automatic water feeding or water-level regulators (<a href="#">steam traps F16T</a>; <a href="#">measuring or indicating instruments G01</a>; <a href="#">for indicating water level G01F</a>; <a href="#">level control in general G05D 9/00</a>)</b> |
| 1/30        | . . with stages, steps, baffles, dishes, circular troughs, or other means to cause interrupted or cascading fall of water ( <a href="#">de-aeration apparatus C02F</a> ) | 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  |
| 1/32        | . arranged to be heated by steam, e.g. bled from turbines  | 5/04         | . with pivoting buckets  |
|             |  | 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   |

- 5/08 . with float-actuated valves
- 5/10 . . and with pistons or membranes unitary with the feed inlet valves
- 5/12 . . and with dipping tubes
- 5/14 . responsive to thermal expansion and contraction, e.g. of solid elements
- 5/16 . . of fluids
- 5/18 . for varying the speed or delivery pressure of feed pumps
- 5/20 . . without floats
- 5/22 . . with floats
- 5/24 . with electric switches
- 5/26 . Automatic feed-control systems ([automatic safety devices F22B 37/42](#); [controlling in general G05](#))
- 5/28 . . responsive to amount of steam withdrawn; responsive to steam pressure
- 5/30 . . responsive to both water level and amount of steam withdrawn or steam pressure
- 5/32 . . influencing the speed or delivery pressure of the feed pumps
- 5/34 . . Applications of valves ([valves per se F16K](#))
- 5/36 . . for feeding a number of steam boilers designed for different ranges of temperature and pressure

**7/00 Auxiliary devices for promoting water circulation**  
[\(adaptation of boilers for promoting water circulation F22B 37/34\)](#)

- 7/02 . Saddles or like directing plates fitted to furnace tubes
- 7/04 . Injectors for water or steam
- 7/06 . Rotary devices, e.g. propellers
- 7/08 . . Arrangements of pumps, e.g. outside the boilers
- 7/10 . . . within the boilers
- 7/12 . Control devices
- 7/14 . specially adapted for locomotive boilers

**11/00 Feed-water supply not provided for in other main groups**

- 11/003 . {[Emergency feed-water supply \(safety devices for boilers in general F22B 37/42\)](#)}
- 11/006 . {[Arrangements of feedwater cleaning with a boiler](#)}
- 11/02 . Arrangements of feed-water pumps ([F22D 11/06 takes precedence](#); [pumps per se F04](#))
- 11/04 . . with means to eliminate steam formation
- 11/06 . . for returning condensate to boiler