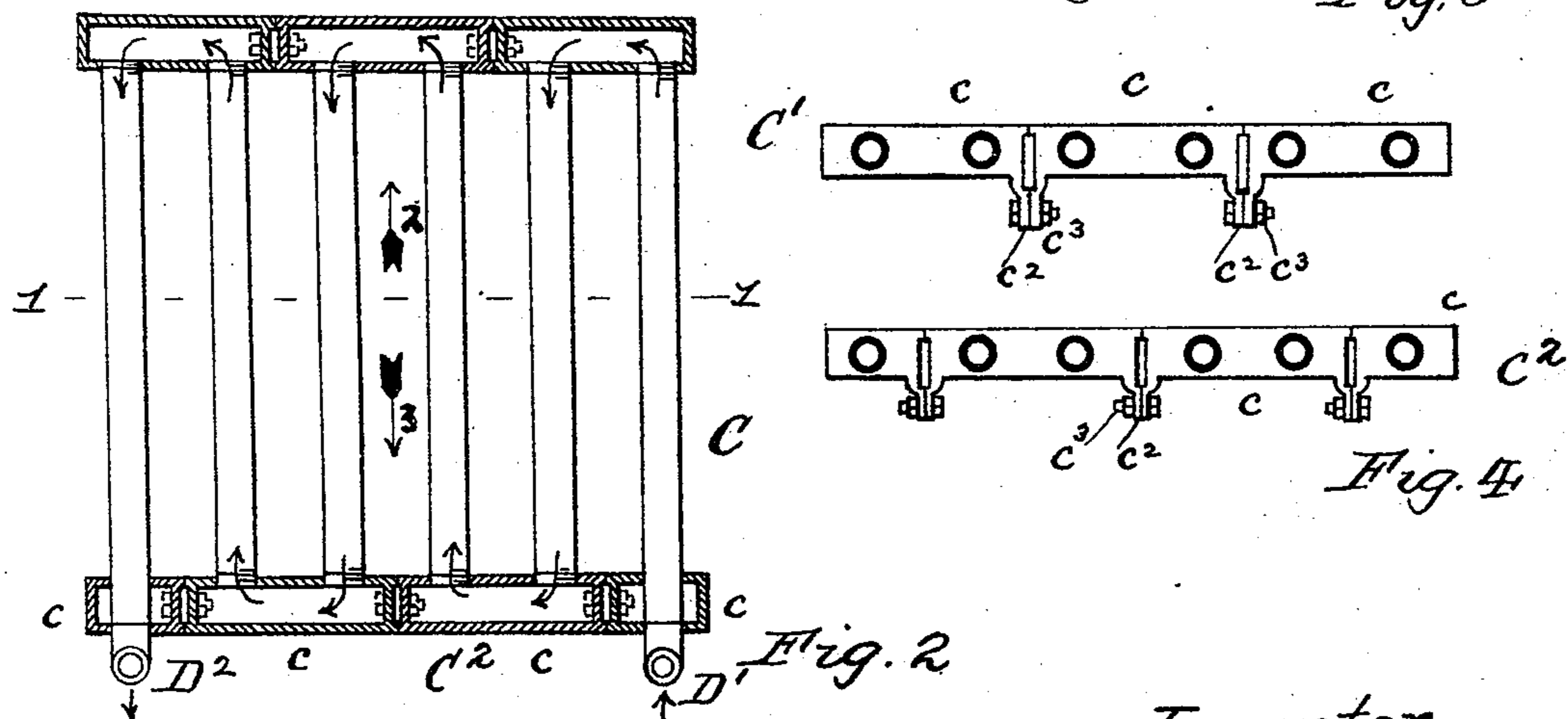
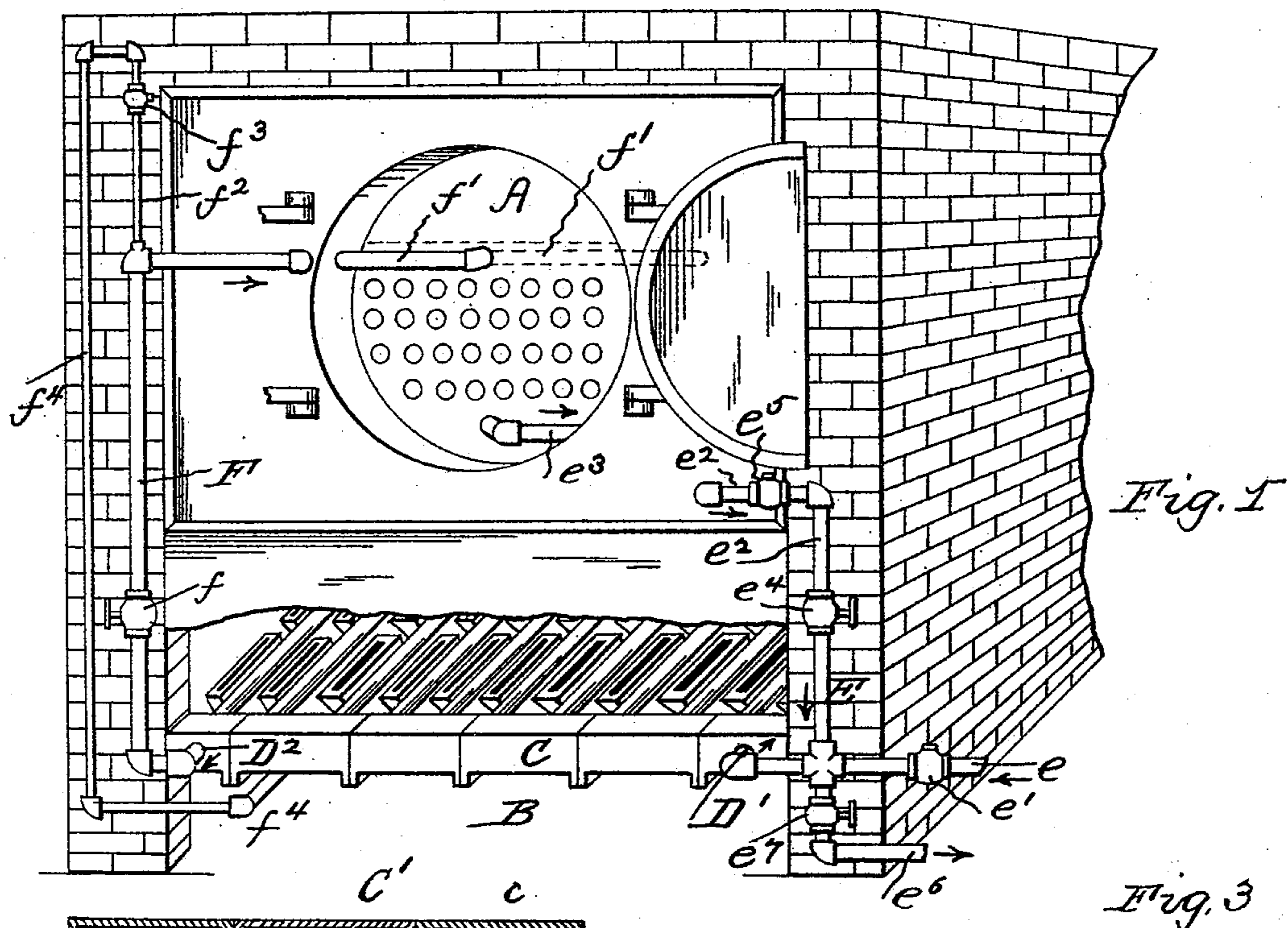


(No Model.)

J. REAGAN.
CIRCULATING WATER BAR GRATE.

No. 459,342.

Patented Sept. 8, 1891.



Witnesses:

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JAMES REAGAN, OF PHILADELPHIA, PENNSYLVANIA.

CIRCULATING WATER-BAR GRATE.

SPECIFICATION forming part of Letters Patent No. 459,342, dated September 8, 1891.

Original application filed March 20, 1891, Serial No. 385,762. Divided and this application filed July 16, 1891. Serial No. 399,788.
(No model.)

To all whom it may concern:

Be it known that I, JAMES REAGAN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Circulating Water-Bar Grates; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to circulating water-bar grates connected to the boiler, and to a feed or supply of the form in which the feed-water circulates through the grate to the boiler, and when the feed is cut off an automatic circulation from the boiler to and through the grate back to the boiler is effected; and it has for its objects to provide a divided feed for the grate, one being partly from the boiler and the other from the pump or injector, a feed from the grate to the boiler, which feed is discharged into the boiler at its top below the water-line, so as not to chill its bottom, for blowing off the scum or foreign matter at the water-line of the boiler from its top through the grate in a direction the reverse of the line of feed to the boiler, so that the sediment in the grate can at the same time be also blown off, for separately blowing off the sediment at the bottom of the boiler without passing through the grate, for avoiding all back-pressure from the boiler to the pump or injector, and when the feed is cut off for an automatic circulation of water from the boiler to and through the grate back to the boiler being effected to keep the grate-bars full of water and prevent their burning out.

My invention accordingly consists of the combinations, constructions, and arrangements of parts, as hereinafter described in the specification, and more particularly pointed out in the claims.

Reference is had to the accompanying drawings, in which—

Figure 1 is an elevation, partly perspective, of a furnace and boiler having water-bar grate and pipe connections with valves and check-valves between the boiler, grate, feed, and blow-off pipes embodying my invention.

Fig. 2 is a sectional plan of grate, showing end bearing-bars composed of hollow sections or couplings bolted together. Fig. 3 is a section on line 1 1, Fig. 2, looking in the direction of arrow 2 and showing in elevation the rear end bearing-bar for the grate; and Fig. 4 is a like view on said line 1 1, looking in the direction of arrow 3 and showing in elevation the front end bearing-bar for the grate.

A indicates a boiler; B, the fire-box, and C the water-bar or circulating grate, which may be of any suitable or desired construction, with or without shaking devices interposed between the water-bars. The water-bars of the grate, as more plainly shown in Figs. 2, 3, and 4, have their ends connected by sectional hollow boxes or couplings c c , having end flanges c^2 , through which pass bolts c^3 for connecting said boxes together to form front and rear end bearing-bars C^2 C' , respectively, composed of sectional hollow couplings or boxes bolted together. The bolting of said sections together makes the end bearing-bars stiff to support the water-bars and avoids expansion of said boxes out of line with each other to disarrange the level of the grate. The latter has an inlet and an outlet-water bar D' and D^2 , respectively, which pass through end sections or boxes c of the front bearing-bar C^2 . Said sections, while hollow to lessen the weight of metal, have no connection with the water-line through the grate, and they are used for supporting the bars D' and D^2 and for end support for the bearing-bar C^2 , the small arrows in Fig. 2 showing the line of feed or circulation through the grate. The bars D' D^2 preferably project through the front wall of the furnace; but they may otherwise be located, as desired. The inlet-water bar D' is coupled with the feed-pipe E, having a branch e provided with a check-valve e' , which closes under pressure from the boiler, said branch pipe e leading to the feed-pump or injector. The provision of the check e' in pipe e prevents the pump or injector being subject to back-pressure from the boiler, as will be hereinafter explained. The upper end e^2 of pipe E leads to the bottom of the boiler, as shown at e^3 , and is provided with a cut-off valve e^4 , which is nor-

mally open, and also with a check-valve e^5 , which opens with pressure from the boiler and closes under feed-water pressure from the pipe e' . Said check-valve e^5 is preferably
 5 located between the cut-off valve e^4 and the boiler. The outlet-water bar D^2 is coupled to a pipe F , having a cut-off valve f , and said pipe leads to the top of the boiler, just below its water-line preferably, as shown at f' , so
 10 as to be preferably always below the top of the water-line in the boiler. Said pipe F has a branch or bleeder f^2 , provided with a normally-closed check-valve f^3 , and said branch f^2 is preferably doubled upon itself and led
 15 or conducted to the ash-pit or other position, as indicated at f^4 , so that any steam or air escaping from the check f^3 is conveyed by pipe f^4 to the ash-pit or other desired place. The end f' of pipe F leads into the boiler
 20 some distance, preferably to beyond the bridge-wall or the line thereof, as indicated by the dotted lines f' . The valve f in pipe F , like the valve e^4 in pipe E , is always normally open.

25 In feeding water to the grate and from thence to the boiler the variations in the pump, or when the injector is run at a slow speed, which is usually the case, causes the check e^5 to have a to-and-fro or wave-like
 30 movement to admit water from the bottom of the boiler through the check to meet and commingle with the feed-water from the pipe e before such water is forced into the grate. The feed for the latter is therefore a divided
 35 one, part being from the pump or injector and part from the bottom of the boiler, and it is more or less hot before entering the grate, wherein it is still further heated and passes by way of pipe F to the top of the boiler to
 40 just below its water-line, where it is ready to burst into steam, if it has not already done so. If not, it is of a high temperature and does not fall to the bottom of the boiler, and as the feed-water for the latter is not forced therein
 45 at its bottom it is not chilled, as is the case when such bottom is subjected to a cold or hot water feed. Hence the water on the bottom of the boiler is always subject to the full heat-units of the furnace, and an economy in
 50 fuel is obtained. The check f^3 in branch pipe f^2 is provided to permit air and steam to escape from the grate-pipes, and thus avoid the formation therein of air or steam traps and also the trapping of water which would
 55 obstruct the free circulation through the grate. By closing the valve e^4 in pipe E and opening valve e^7 in pipe e^6 the boiler is blown off from its top through the grate reversely to the line of its feed and all scum or other
 60 foreign matter at the water-line of the boiler or its top, as well as the sediment in the grate, is blown off. By opening cock e^4 and closing cock f the bottom of the boiler is blown off from or through the pipe e^2 without passing
 65 through the grate. By alternately opening and closing cocks f and e^4 the boiler is blown off from its top and bottom while in use or

fired up, and to prevent the steam from the boiler filling the grate during blowing off the
 cocks f and e^4 are both opened near the con- 70
 clusion of the blowing-off operation in order to admit of the top and bottom of the boiler being blown off simultaneously. It will be noticed, therefore, that as the grate is the low-
 75 est part of the boiler the sediment in the grate and the scum or other foreign matter at the top of the boiler are blown off through the grate reversely to its line of feed and the bottom of the boiler or its sediment or grounds is
 80 blown off without passing through the grate; that such described operations are effected while the boiler is in action without blowing the water out of the grate at the end of the
 85 blow-off operation, thereby avoiding all danger of burning out the grate after such operation. When the feed from pipe e is cut off, the check in the latter closes to prevent back-pressure from the boiler upon the pump or
 90 injector, and the check e^5 fully opens to provide for an automatic circulation of the water from the boiler to and through the grate back
 95 to the boiler to keep water in the grate to prevent it burning out and to utilize the heat of the same, such circulation being provided for by reason of the end f' of pipe F being below
 100 the top of the water-line of the boiler. The grate and boiler therefor are always kept clean and the formation of scale is avoided, so that said parts are always in the best possible condition to utilize all the heat-units for
 105 the generation of steam, and thereby resulting in an economy in the use of fuel.

The foregoing invention is a division of application filed by me March 20, 1891, Serial No. 385,762, for improvements in circulating
 105 water-bar grates.

What I claim is—

1. In combination with a water-bar grate having inlet and outlet ends, pipe connections between said inlet end and the bottom of the
 110 boiler, a normally-open cut-off and a check-valve in said pipe connection, closing against the feed and opening with the boiler-pressure, a feed-pipe connected with the boiler and said check, said feed-pipe provided with a
 115 check closing against the boiler-pressure, a pipe connection between said outlet-pipe and the water-line of the boiler and having a cut-off and a branch pipe with check normally closed, and a blow-off-pipe connection for the
 120 inlet-pipe of the grate and its pipe connection with the bottom of the boiler, substantially as set forth.

2. The combination of the boiler A , water-bar grate C , pipe E for the inlet end of the
 125 grate, having blow-off e^6 , with valve e^7 ; feed-water pipe e , with check e' , check e^5 , cut-off e^4 and leading to the bottom of the boiler, and pipe F for the outlet end of the grate, having
 130 cut-off f and leading to the top of the boiler, so as to be below the water-line, and having a branch f^2 , with check f^3 , substantially as set forth.

3. The combination of a boiler, a water-bar

grate, pipe connections between the boiler and grate, and the feed-water pipe with cut-offs and check-valves, arranged as shown, whereby a divided feed, partly from the pump
5 and partly from the boiler, is fed to the grate, the water from the grate being fed to the top of the boiler below its water-line, the boiler being adapted to be blown off from its top to remove scum therefrom and sediment from
10 the grate, and also being adapted to be blown off from its bottom, and when the feed is cut off having an automatic circulation between the boiler and the grate.

4. The combination of a boiler, a water-bar grate having inlet-pipe D', outlet-pipe F, pipe E, coupled to said pipe D', having blow-off pipe e⁶, feed-pipe e, with check e', seating with pressure from the boiler, and check e⁵, seating with the pressure from the feed-water
20 device and cut-off e⁴ and leading into the boiler near its bottom, substantially as shown.

5. The combination of a boiler, a water-bar grate having a divided feed for said grate partly from the feeding device and partly
25 from the boiler, and a feed from the grate to the boiler, which feed is conducted into the boiler near the top of its water-line, substantially as set forth.

6. The combination of a boiler, a water-bar grate, pipe connections between the boiler
30 and the grate, the feed-water pipe with cut-offs and check-valves arranged as shown, and a blow-off pipe whereby the scum and other foreign matter at the top of the boiler and the
35 sediment in the grate are blown off through

the grate reversely to the line or path of its feed-water and the sediment at the bottom of the boiler is blown off through the blow-off pipe without passing through the grate, substantially as set forth. 40

7. In a grate, the combination, with tubular grate-bars, of hollow sectional end bearing-bars connecting said tubular bars, the sections for said end bars being bolted together, supply-pipe connections with valves, as shown,
45 between the bottom of the boiler and the inlet-pipe of the grate, valved pipe connections between the outlet end or pipe of the grate and the top of the boiler, and a blow-pipe with valve for the grate and boiler, substan- 50 tially as set forth.

8. In a grate, the combination, with tubular grate-bars, of hollow sectional end bearing-bars connecting said tubular bars, the sections for said end bars being bolted together,
55 pipe connection with cut-off and check valves, arranged, as shown, between the inlet end of the grate and the bottom of the boiler, a supply-pipe with check-valve and a blow-pipe with cut-off connected to said pipe connec- 60 tion, and a pipe connection with cut-off valves between the outlet end of the grate and the top of the boiler, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES REAGAN.

Witnesses:

M. F. HALLECK,
FRANKLIN MOORE.