

(No Model.)

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H. D. WENDT.

COMBINED GRATE BAR AND FEED WATER HEATER.

No. 478,726.

Patented July 12, 1892.

Fig 2.

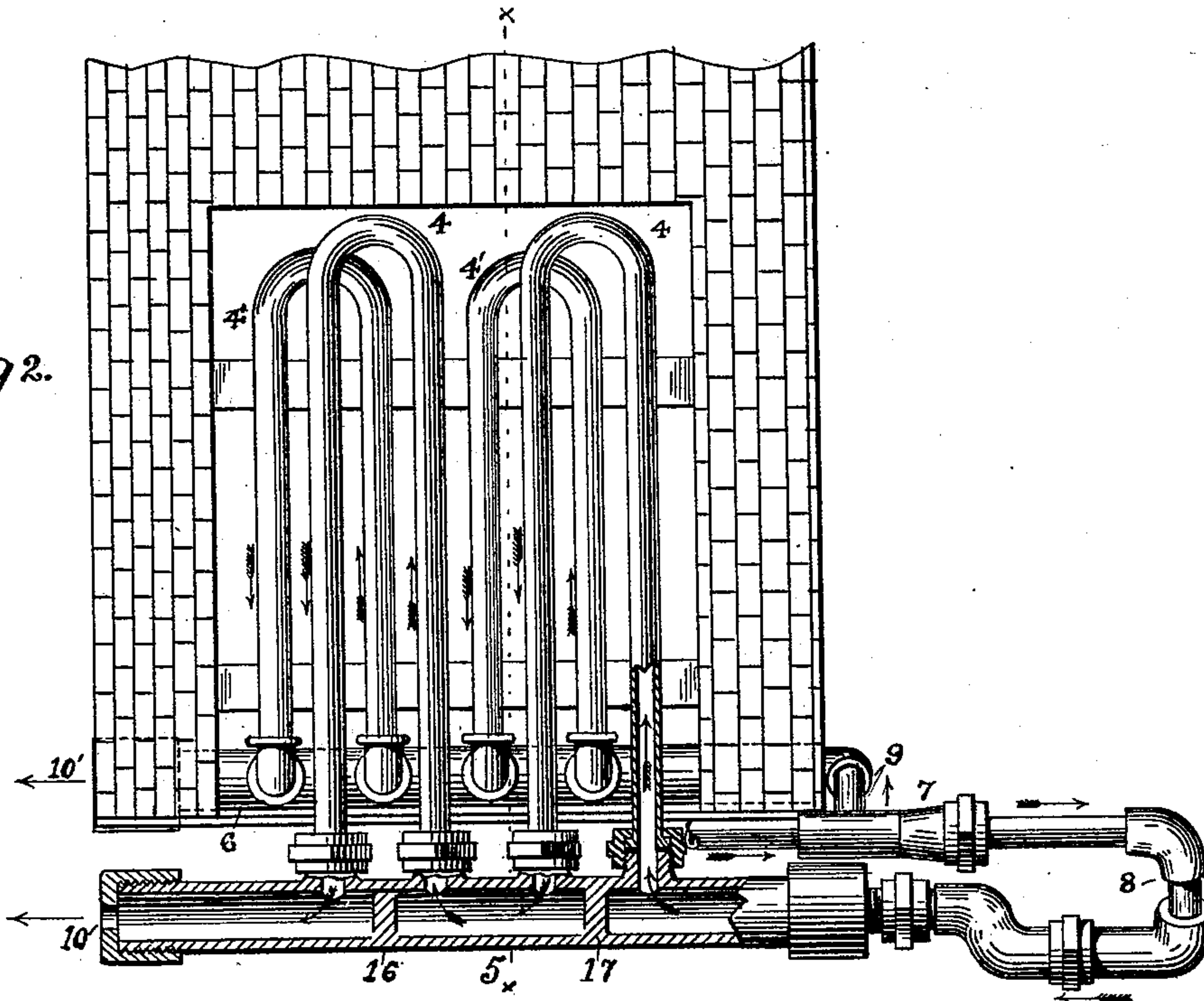
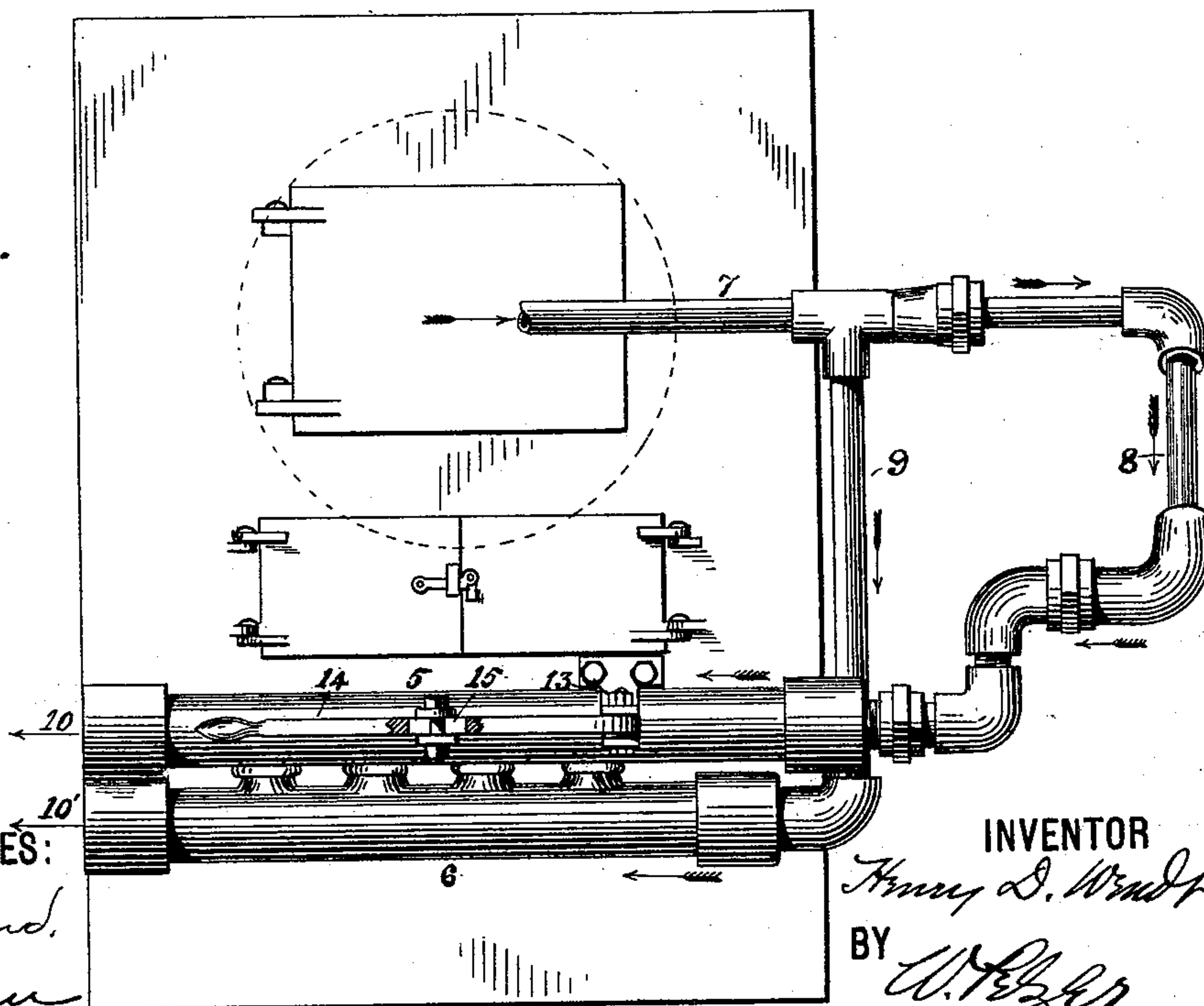


Fig 1.



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(No Model.)

2 Sheets—Sheet 2.

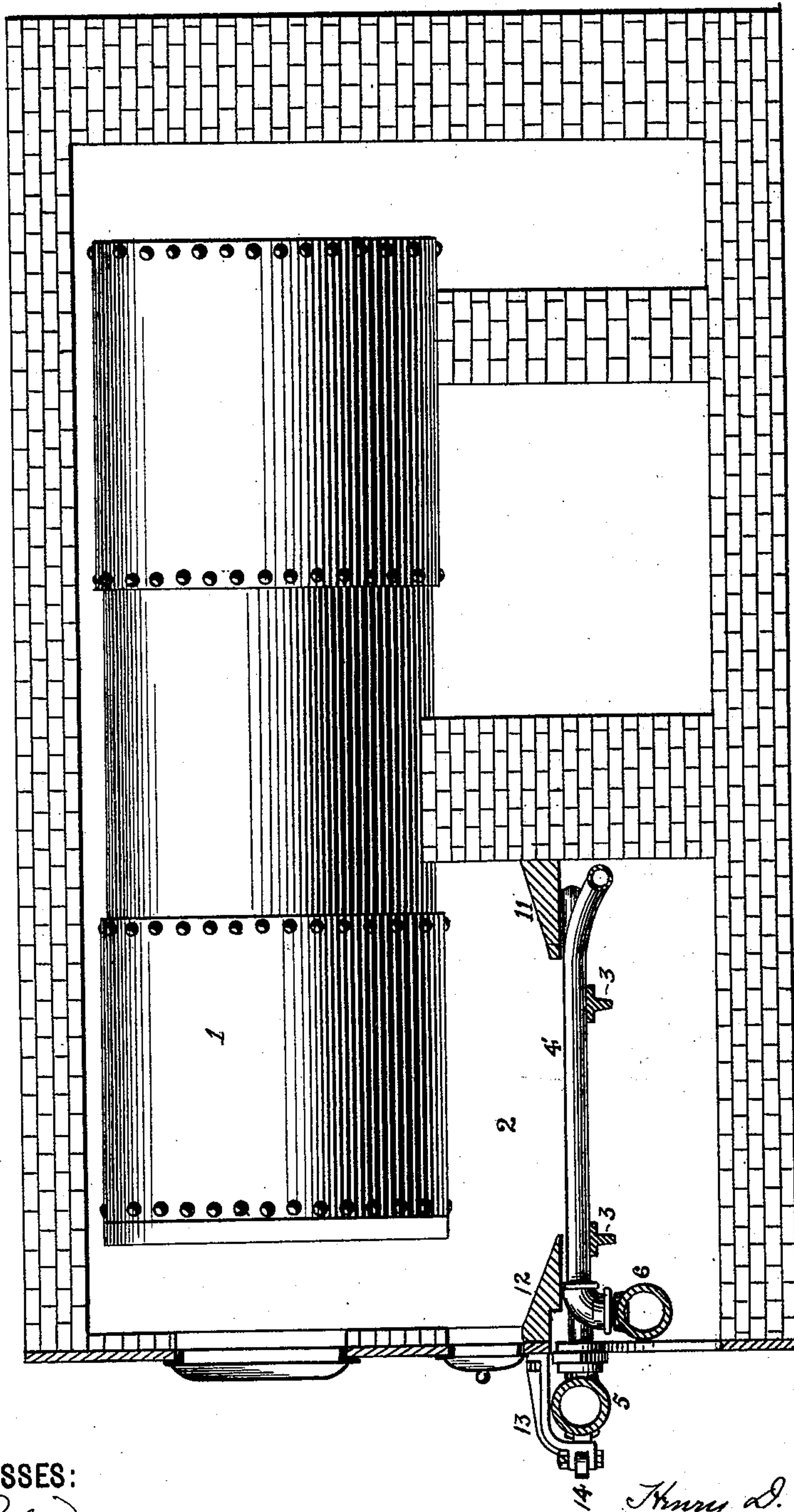
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Fig. 3.



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# UNITED STATES PATENT OFFICE.

HENRY D. WENDT, OF HOBOKEN, NEW JERSEY.

## COMBINED GRATE-BAR AND FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 478,726, dated July 12, 1892.

Application filed March 30, 1891. Serial No. 386,936. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY D. WENDT, a citizen of the United States, residing at Hoboken, in the county of Hudson and State of New Jersey, have invented a certain new and useful Improvement in Combined Grate-Bars and Feed-Water Heaters, of which the following is a specification.

The main object of my invention is to provide grate-bars for steam-boiler furnaces or other furnaces which will be simple, efficient, and comparatively inexpensive in construction; and it consists in constructing grate-bars in tubular form, so that water or other cooling fluid may be passed therethrough, thus preventing the burning and warping of the bars and preventing the "clinkers" from adhering thereto. By the use of my invention I also provide a simple and efficient form of feed-water heater when water is used as the cooling medium. The grate-bars can be constructed to be either movable or stationary.

In carrying my invention into effect I construct the grate-bars preferably of wrought-iron pipe or malleable iron, and prefer to use water as the cooling medium, the grate-bars thus forming a simple form of feed-water heater. The series of pipes are connected together in such manner as will permit the water to flow through them successively. I also provide means for shaking the grate-bars, and prefer to couple alternate pipes together. Thus one set may be made movable and the other stationary, or both may be made to move either separately or in opposite directions, or the pipes may be coupled together to form a number of sections, and all or part of them being made movable. The water for cooling the tubes I prefer to take direct from the main supply—that is, before passing through the boiler or auxiliary vessel—and where the water-pressure is not sufficient I provide means for forcing it through the tubes in order to keep up a constant circulation. I connect the outlet of the grate-bars with the ordinary condenser or feed-water supply, thus utilizing the grate-bars as a feed-water heater; or I may instead provide a tank for receiving the heated water and again pass it through the bars after having cut off the main supply until it reaches a temperature close to

the scaling-point, whereupon the tubes are again connected with the main supply. The heated water may also be used for other purposes.

In applying my invention to steamship-boilers the sea-water may be utilized for cooling the bars and after passing through the bars is discharged into the bilge of the vessel. It is not necessary to provide means for keeping a constant flow when the sea-water is used for cooling, as the sea-pressure is sufficient for this purpose, it only being necessary in this instance that the water be forced through the grate-bars at such rate as will prevent it becoming heated to the point at which scales are formed.

My invention may also be applied to kitchen-ranges mainly for the purpose of making hot water. Instead of using the ordinary water back or coil in the range, I provide grate-bars of the above general description and connect the same with the water-tank in the usual manner. The grate in this instance can also be made movable.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of a steam-boiler with my invention applied thereto. Fig. 2 is a plan view showing the grate-bars and connections, portions being in section; and Fig. 3 is a side view of the furnace, being a section on the line *xx* of Fig. 2.

1 is an ordinary boiler supported in the usual manner.

2 is the fire-box, having cross-bars 3 3, upon which are supported the hollow grate-bars 4 4'. The bars 4 are coupled to the connecting-tube 5, which constitute the movable section of the grate. The bars 4' are coupled to the connecting-tube 6 and constitute the stationary section of the grate. The connecting-tube 5 is connected to the water-supply pipe 7 by the swivel-jointed section 8. The pieces of tubing between the elbows in the section have a slight play, so that in moving the grate-bars the couplings will not be strained. The connection to the stationary connecting-tube 6 is through pipe 9. The outlets from the grate-bars are at 10 10'. The outlet 10 has a similar swivel-jointed section (not shown) as the inlet 7. The grate-bars are held down upon



the supporting-bars 3 3' at the ends by the projecting part 11 and the dead-bar 12. (Omitted in Fig. 2.) Pivoted upon the arm 13 is the lever 14, which has a sliding connection at 15 with the connecting-tube 5, whereby the grate-bars 4 can be moved back and forth. The grate-bars, being supported upon cross-bars and free at both ends, passing under the dead-bar and under a projection from the bridge-wall, are free to expand and contract, which greatly reduces warping. The connecting-tube 5 has partitions 16, (shown in Fig. 2,) forming chambers therein, so that the water will pass through the tubes successively. The connecting-tube 6 has similar partitions arranged therein, but are not shown in the drawings.

The various connections can be accomplished in numerous ways without departing from the spirit of my invention. For instance, the water-supply connection to the connecting-tube 5 may be by a section of steam-hose, or the grate-bars may be coupled together by elbows or bends instead of by the tubes 5 and 6, or the grate-bars may be made of single lengths of tubing coupled together by elbows instead of a double tube with the return-bend.

In making the grate-bars of malleable iron they may be formed as single bars with two passages therein.

I am aware that hollow grate-bars for passing a cooling fluid therethrough have been proposed, and therefore do not lay claim, broadly, to the use of such a grate-bar.

What I claim is—

1. In a furnace-grate, the combination of a series of tubular grate-bars, water inlet and outlet pipes connected to said bars by a yielding connection, and means for shifting said grate-bars back and forth, substantially as set forth.

2. In a furnace-grate, the combination of a series of tubular grate-bars, water inlet and outlet pipes connected to said series of bars by a yielding connection, cross-bars supporting said tubular grate-bars, and means for shifting said grate-bars back and forth upon said cross-bars, substantially as set forth.

3. In a furnace-grate, the combination of a series of tubular grate-bars, a cross-head or connecting-tube connecting said grate-bars, water inlet and outlet pipes connected to said cross-head by a yielding connection, cross-bars supporting said grate-bars, and means for shifting said grate-bars back and forth upon said cross-bars, substantially as set forth.

4. In a furnace-grate, the combination of a series of tubular grate-bars, a cross-head or connecting-tube connecting said grate-bars, water inlet and outlet pipes connected to said cross-head, chambers arranged in said cross-head, whereby the water is caused to flow through said grate-bars successively, said inlet and outlet pipes being connected to said cross-head by a yielding connection, cross-bars supporting said grate-bars, and means

for shifting said grate-bars back and forth upon said cross-bars, substantially as set forth.

5. In a furnace-grate, the combination of a series of tubular grate-bars arranged in two or more sections, a cross-head or connecting-tube connecting the bars of each section, water inlet and outlet pipes connected to said cross-heads by yielding connections, cross-bars supporting said grate-bars, and means for shifting said grate-bars back and forth upon said cross-bars, substantially as set forth.

6. In a furnace-grate, the combination of a series of tubular grate-bars supported upon cross-bars and arranged in one or more stationary sections and one or more movable sections, a cross-head or connecting-tube connecting the bars of each section, water inlet and outlet pipes connected to the cross-heads of the stationary sections, water inlet and outlet pipes connected to the cross-heads of the movable sections by a yielding connection, and means for shifting said movable sections back and forth upon said cross-bars, substantially as set forth.

7. In a furnace-grate, the combination of a series of tubular grate-bars supported upon cross-bars and arranged in one or more stationary sections and one or more movable sections, a cross-head or connecting-tube connecting the bars of each section, water inlet and outlet pipes connected to the cross-heads of the stationary sections, water inlet and outlet pipes connected to the cross-heads of the movable sections by a yielding connection, chambers arranged in said cross-heads, whereby the water is caused to flow through said grate-bars successively, and means for shifting said movable sections back and forth upon said cross-bars, substantially as set forth.

8. In a furnace-grate, the combination of the double tubes 4 and 4', constituting the grate-bars, cross-heads 5 and 6, connecting together the tubes 4 and 4', respectively, water-supply pipe 7, a yielding connection from said pipe 7 to the cross-head 5, a rigid connection from said pipe 7 to the cross-head 6, cross-bars 3, supporting the grate-bars, and means for shifting the grate-bars back and forth upon said cross-bars, substantially as set forth.

9. In a furnace-grate, the combination of the double tubes 4 and 4', constituting the grate-bars, cross-heads 5 and 6, connecting together the tubes 4 and 4', respectively, chambers arranged in said cross-heads, water-supply pipe 7, a yielding connection from said pipe 7 to the cross-head 5, a rigid connection from said pipe 7 to the cross-head 6, cross-bars 3, supporting the grate-bars, and means for shifting the grate-bars back and forth upon said cross-bars, substantially as set forth.

10. The combination, with a steam-boiler, of a furnace-grate composed of the double tubes 4 and 4', cross-heads 5 and 6, having chambers formed therein, water-supply pipe



7, a swivel-jointed section 8, connecting the  
said pipe 7 with the cross-head 5, a rigid con-  
nection 9, connecting said pipe 7 with the  
cross-head 6, outlets 10 and 10', connecting  
5 said tubes 4 and 4' with the condenser or  
feed-water supply, and the lever 14, pivoted  
on the arm 13 and connected with the cross-  
head 5, whereby the tubes 4 are shifted back

and forth upon cross-bars 3, substantially as  
and for the purpose set forth.

This specification signed and witnessed this  
21st day of March, 1891.

HENRY D. WENDT.

Witnesses:

JAMES H. PHIPPS,  
W. PELZER.