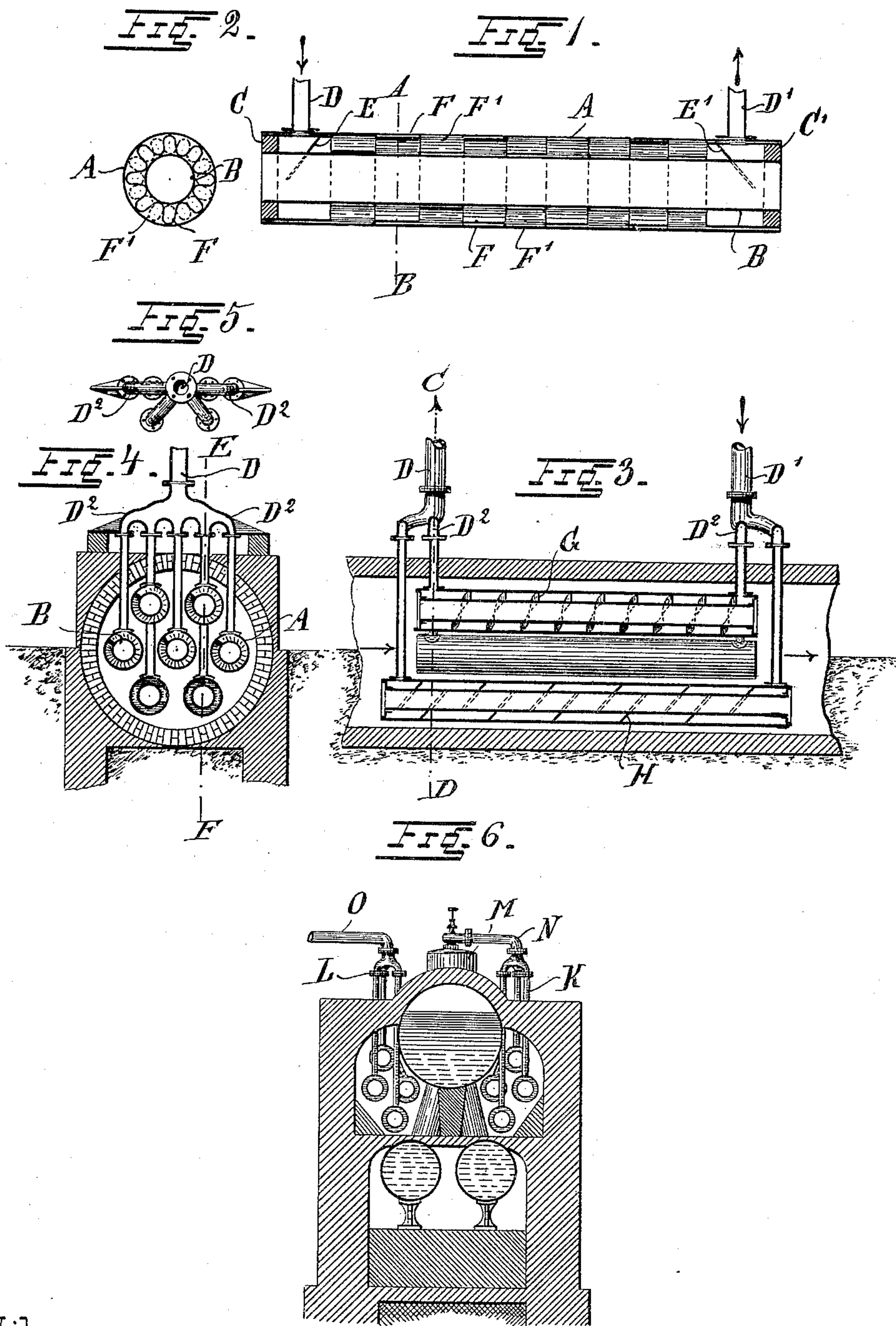


(No Model.)

W. FEHRMANN.
APPARATUS FOR VAPORIZING AND SUPERHEATING WATER CONTAINED
IN STEAM.

No. 604,524.

Patented May 24, 1898.



Witnesses
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UNITED STATES PATENT OFFICE.

WOLDEMAR FEHRMANN, OF MOSCOW, RUSSIA.

APPARATUS FOR VAPORIZING AND SUPERHEATING WATER CONTAINED IN STEAM.

SPECIFICATION forming part of Letters Patent No. 604,524, dated May 24, 1898.

Application filed May 27, 1897. Serial No. 638,412. (No model.)

To all whom it may concern:

Be it known that I, WOLDEMAR FEHRMANN, a subject of the Emperor of Russia, and a resident of Moscow, in the Empire of Russia, have invented a certain new and useful Improved Apparatus for Vaporizing the Water Contained in Steam and Superheating the Latter, of which the following is a full, clear, and exact description.

10 The present invention consists of an apparatus for vaporizing the water contained in aqueous steam and superheating the latter and of the details hereinafter particularly described.

15 In order to render the present specification more easily intelligible, reference is had to the accompanying drawings, in which similar letters denote similar parts throughout the several views.

20 Figure 1 is a longitudinal section through one member of the apparatus, which may consist of more than one member. Fig. 2 is a section on line A B of Fig. 1. Fig. 3 is a longitudinal section through an apparatus consisting of several members on line E F of Fig. 4. Fig. 4 is a transverse section on the line C D of Fig. 3. Fig. 5 is a detail plan of the pipe-connecting piece for the various members, and Fig. 6 a transverse section showing a modified arrangement of the members.

30 The apparatus consists of one or more members, and each member consists of two tubes A and B, arranged concentrically one within the other, the ends of the annular space thus formed between the tubes being closed by annular rings or plates C C'. Steam is introduced into the space between the tubes by means of the inlet-pipe D and conducted off 40 by the outlet-pipe D'.

45 The apparatus may be mounted in the smoke-box or chimney of any ordinary furnace or steam-boiler or in the fire or smoke chamber or chimney of a furnace specially built to heat the said apparatus, which will thus be heated exteriorly and also interiorly through pipe B by the escaping gases of combustion. In order to increase the transmission of the heat to the steam, which latter 50 is a bad conductor of heat, and to distribute the steam well around the space between the two tubes A and B, the latter is provided

with a series of corrugated rings arranged around the same in section, as at F and F', the corrugations of one section or ring of corrugations F being displaced with regard to those of the next section F', Fig. 2. 55

Baffle-plates E and E' are arranged, respectively, at the inlet and outlet tubes D and D' in order to prevent the steam from passing 60 direct from the inlet to the outlet without circulating around the inner tube. The corrugated rings being by nature elastic are suitably attached to the outside of the inner tube and will consequently when the latter is 65 pressed into the outer tube close tightly onto or against the interior surface of the latter. Thus the heat from the interior and exterior tubes will be conducted by the metal plates or corrugated ring to the annular space between the pipes and be transmitted to the steam. 70

As shown at Figs. 3 to 5, several of these apparatuses may be combined and placed in the flue of a furnace or otherwise heated. In 75 this case seven members A B are employed, the five upper members being of equal length and arranged two above three and the two lower members being somewhat longer in order to allow room for their upwardly-extending inlet and outlet tubes to pass the upper members. The inlet and outlet tubes to each member extend upwardly through the brick-work of the flue and are each provided with a flange at its upper end, said flanges being 85 all connected to the main inlet D by means of a series of branches D² at one end and by a similar branch-pipe system to the main outlet D'. The advantage of this arrangement is that all the flanges which generally cause 90 most trouble are arranged outside the brick-work and are consequently easily accessible. As shown at these figures, instead of the corrugated rings spirally-arranged partition-plates may be arranged, as at G, or a series 95 of slantingly-fixed baffle-plates H may be employed.

As shown at Fig. 6, two systems or series of members may be arranged one in each side flue of a boiler-furnace, the pipe connections 100 to and from the same being similarly arranged to those of Fig. 3, with the exception that only four branches are necessary to each connecting-pipe. In this case the steam first passes

from the dome M of the boiler along pipe N to the right-hand series and then from the outlet-pipe of these to the inlet-pipe of the left-hand series and then out at O.

5 The apparatus may be made of any suitable material—such as iron, copper, or the like—and the particular shape of the connecting-pipes for the inlets and outlets of the members may be governed by any particular cir-
10 cumstances.

The apparatus may also be employed as feed-water heater or as water-heater for hot-water-heating systems.

Having now particularly described and as-
15 certain the nature of my said invention and in what manner the same is to be performed, I declare that what I claim, and wish to secure by Letters Patent, is—

1. The combination of two concentrically-
20 arranged tubes, annular plates to close the ends of the annular space between said tubes, an outlet and inlet steam-pipe at opposite ends of said exterior tube, baffle-plates across the outlet and inlet openings, and a series of
25 plates arranged in the annular space formed between the tubes, so as to cause the steam to take a zigzag course through the same and to impart heat direct to the steam substan-
tially as described.

30 2. The combination of a series of members, each member consisting of two concentrically-arranged tubes, having the ends of the annular space formed between the same closed by annular plates, a steam-inlet extending up-

wardly from each of the members, and a steam- 35
outlet also extending upwardly at the oppo-
site end of each member, baffle-plates within
each member, and a series of plates arranged
within each member to cause the steam to 40
take a zigzag course through the said mem-
ber as specified, the said outlet and inlet pipes
having flanges and being so arranged that
their flanges extend out of the heating-flue
which incloses the members, in two groups at
each end of the same, a main inlet for the 45
steam having branches to connect with each
of the individual inlet-pipes and a main out-
let similarly constructed substantially as de-
scribed.

3. The combination of an exterior and an 50
interior tube concentrically arranged, plates
to close the annular space between the two
tubes, an inlet-pipe at one end and an outlet-
pipe at the other end of the exterior tube, a
slantingly-arranged baffle-plate within the 55
space between the two tubes and across the
inlet and outlet, a series of corrugated rings
arranged between the outlet and inlet, said
rings fitting tightly between and contacting
with each of the adjacent walls of the tubes 60
alternately, substantially as described.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

WOLDEMAR FEHRMANN.

Witnesses:

YAKOB PENNERT,
CONSTANTIN PUPOF.