

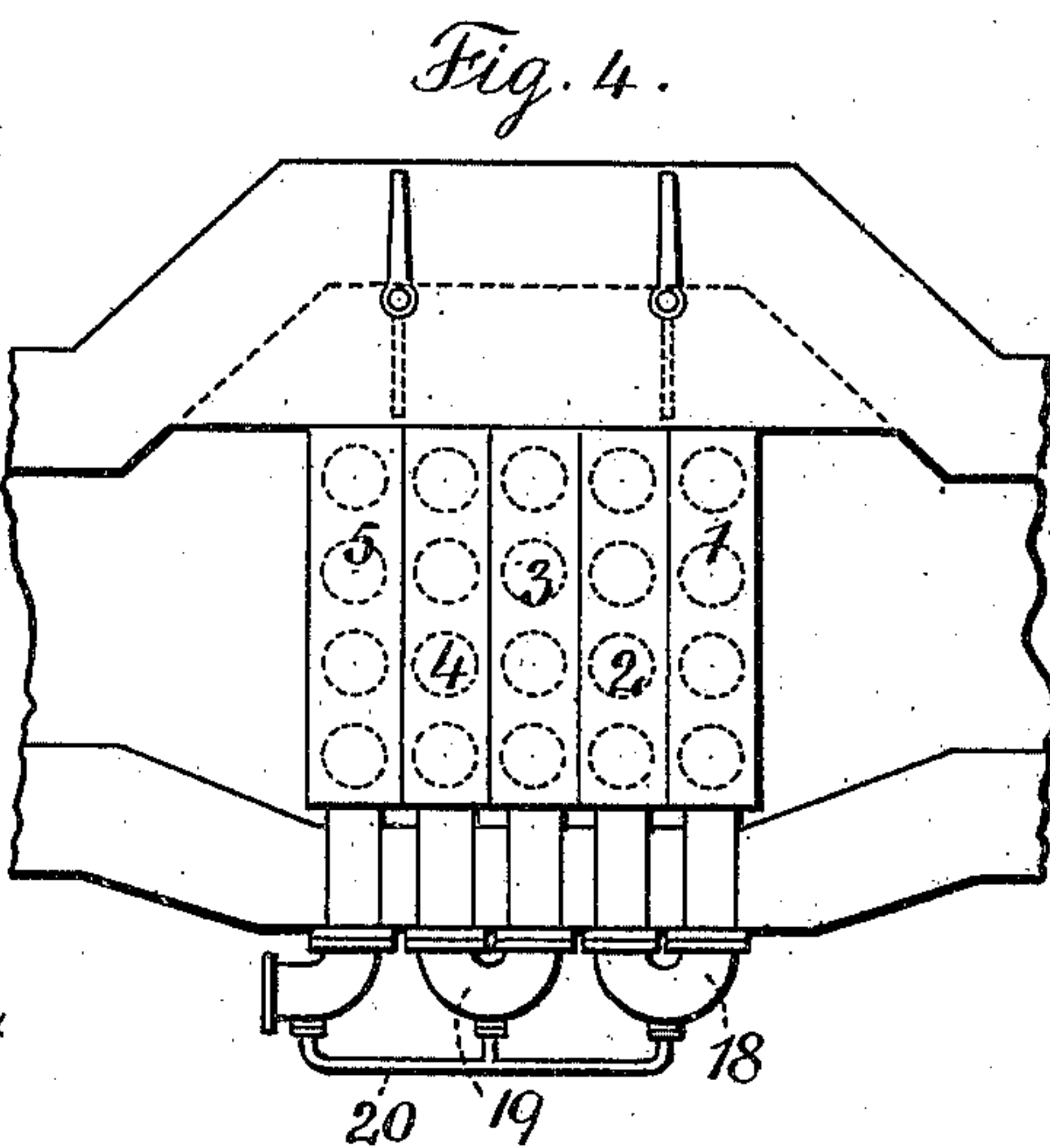
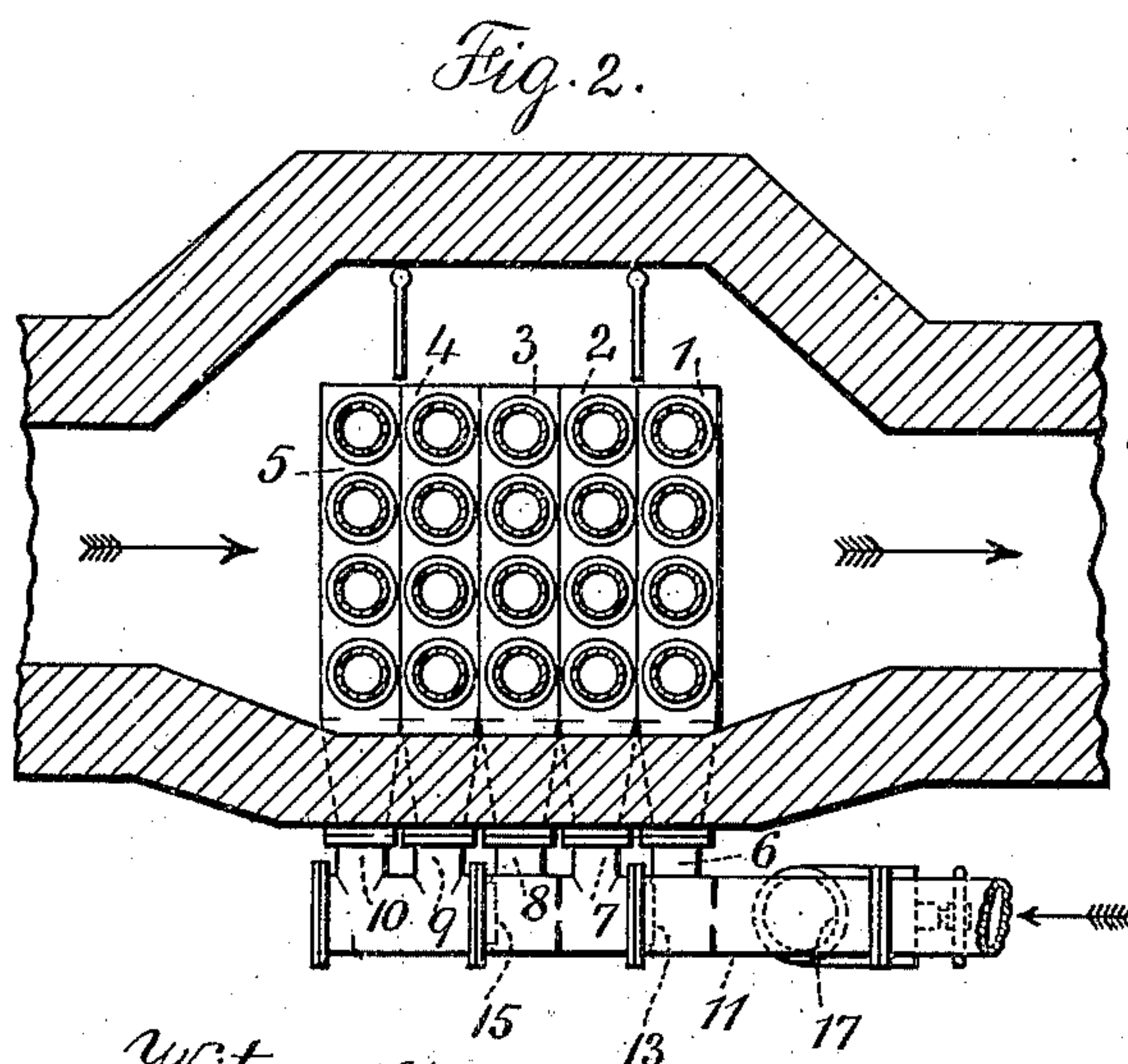
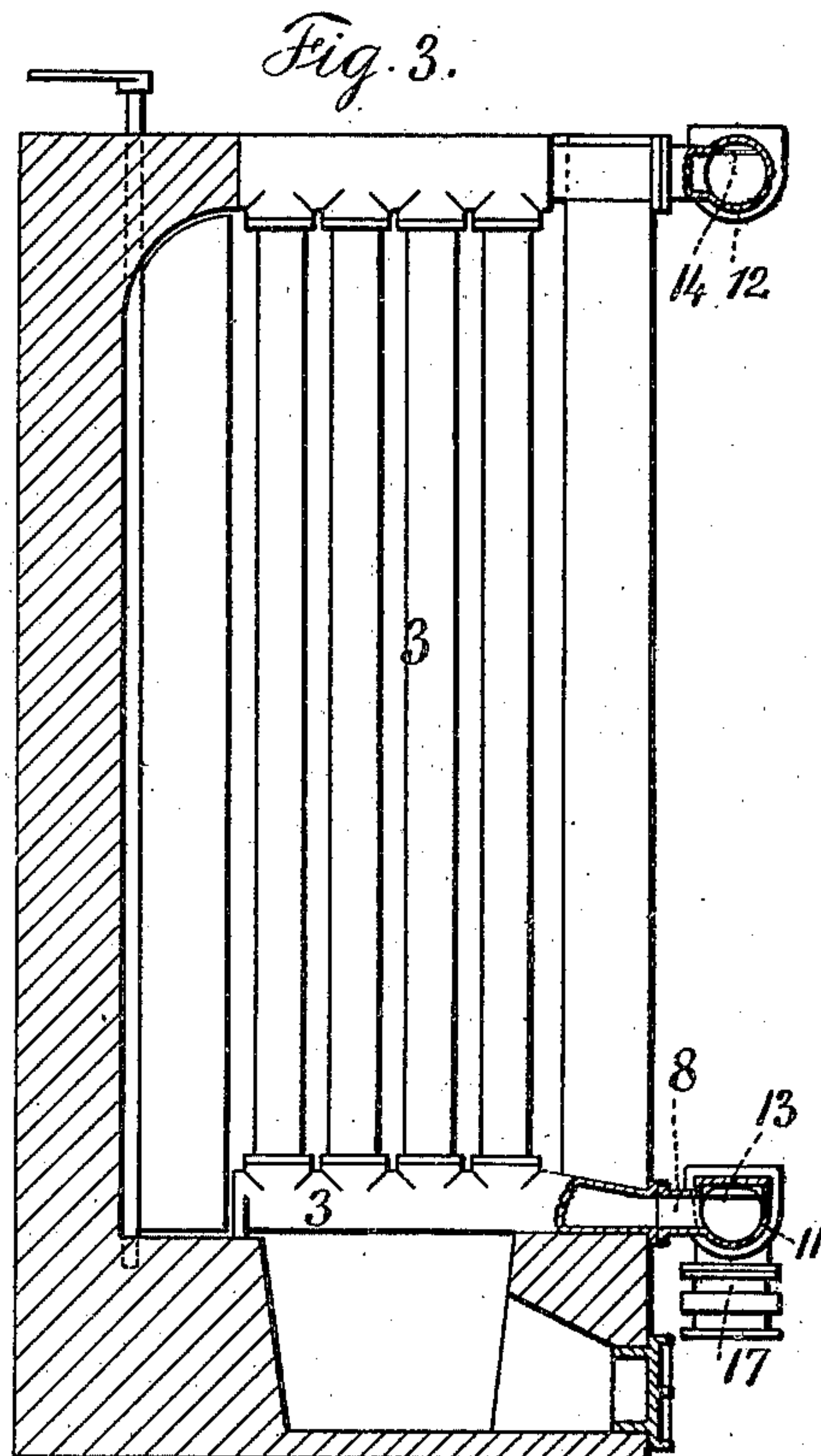
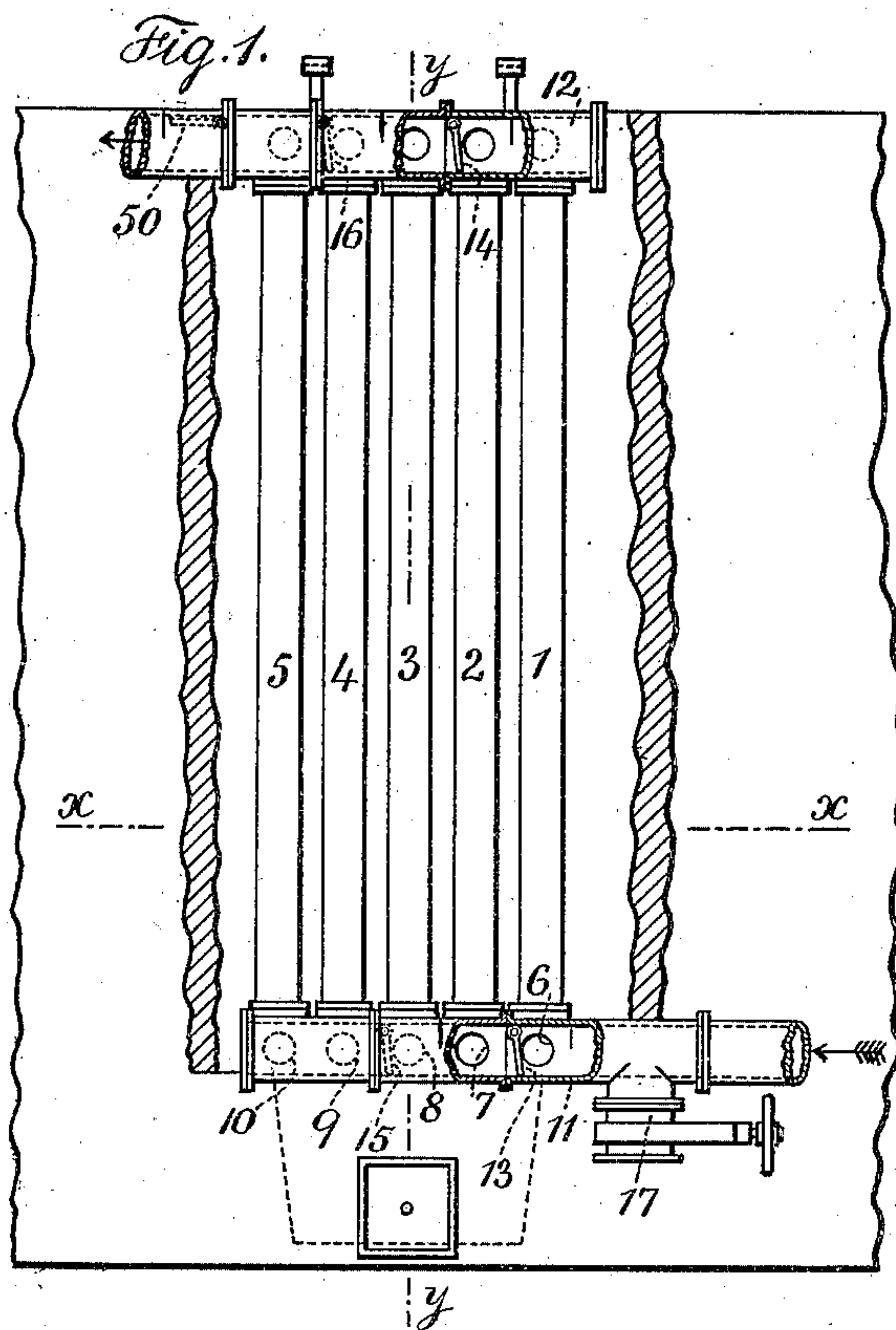
No. 755,366.

PATENTED MAR. 22, 1904.

A. W. EKSTRÖM.
HEATER FOR WATER.
APPLICATION FILED OCT. 1, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:
J. Staib
Chas. H. Smith

Inventor:
Arthur Wilhelm Ekström
per L. W. Terrell & Son attys.

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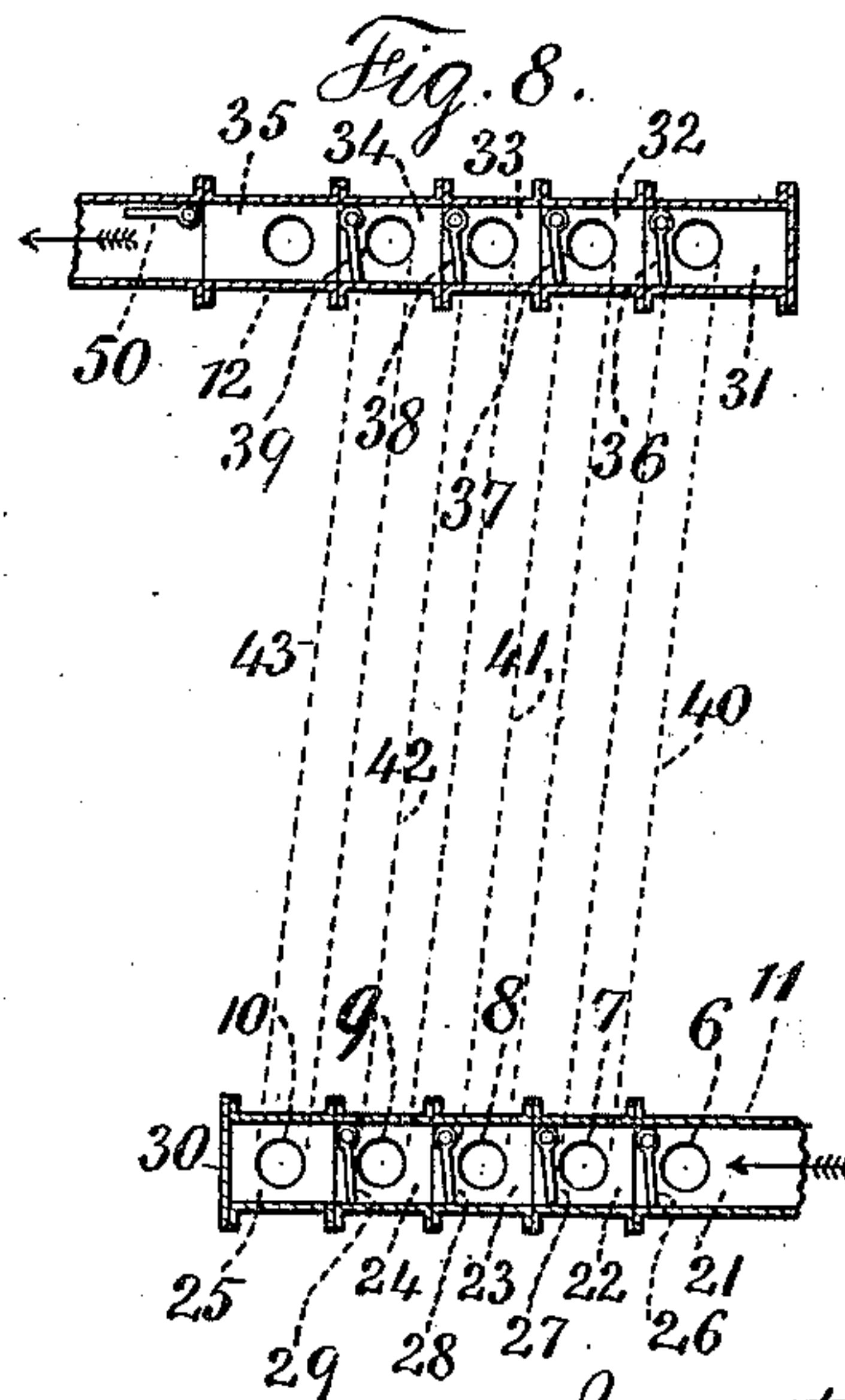
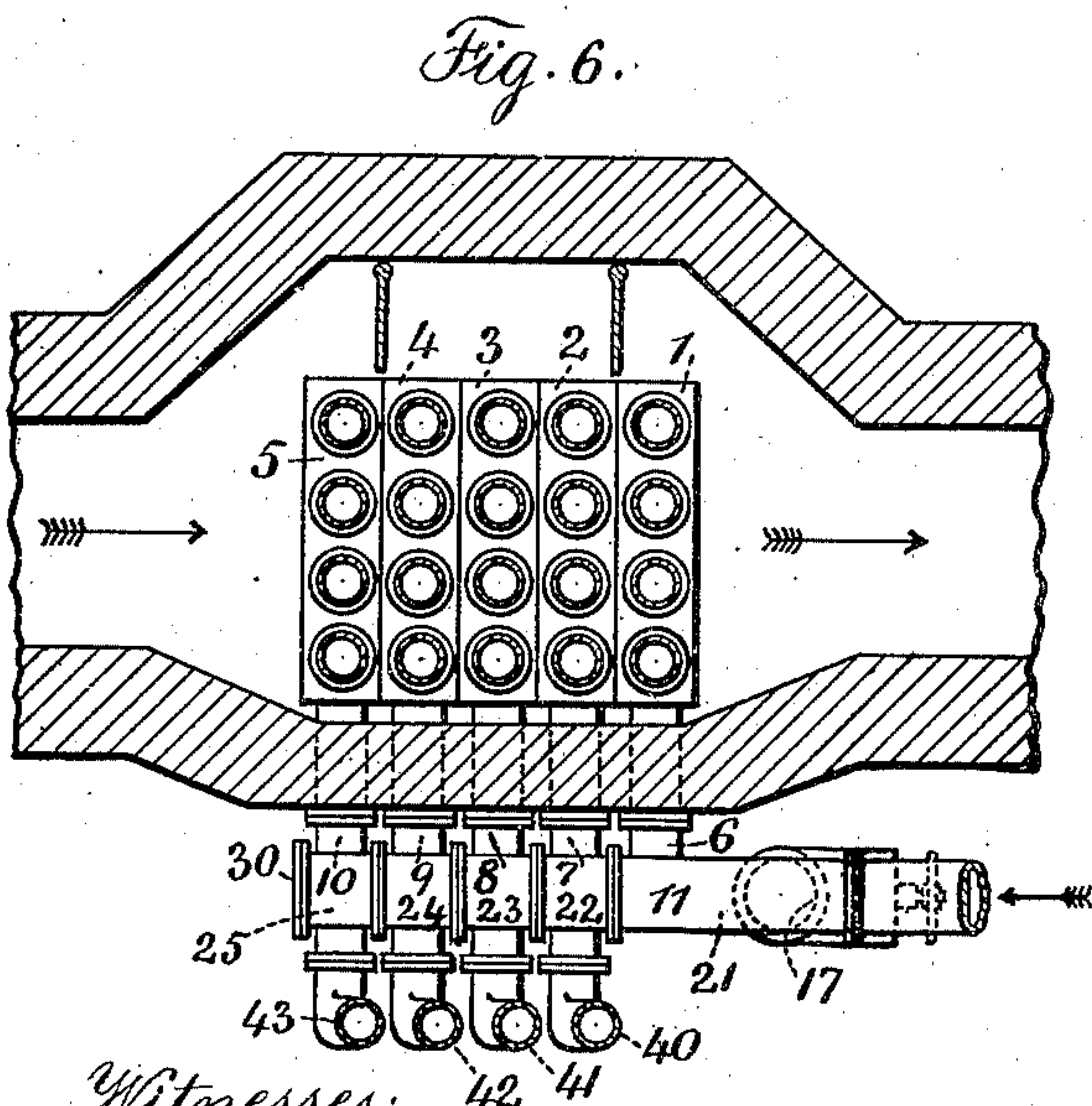
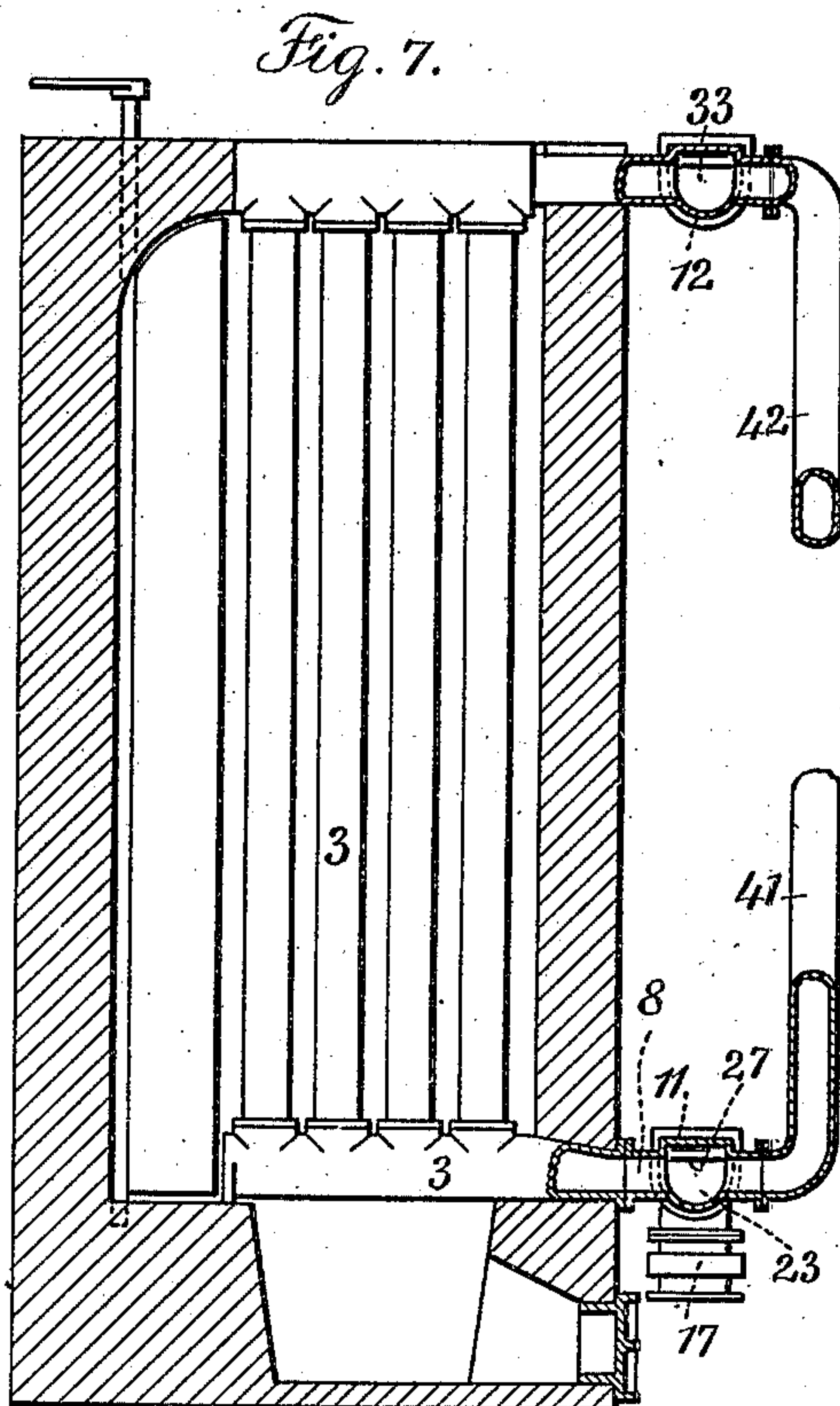
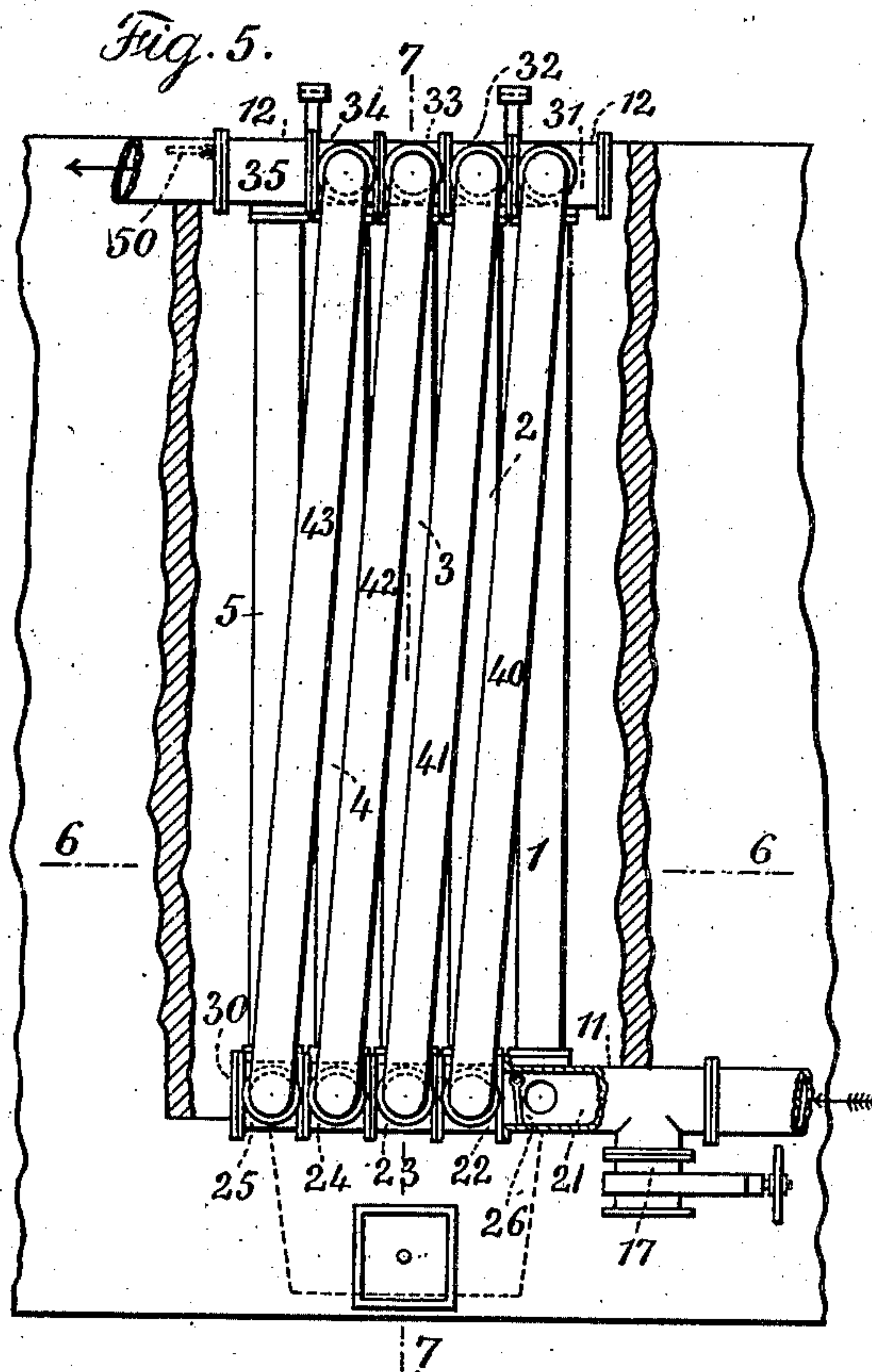
PATENTED MAR. 22, 1904.

A. W. EKSTRÖM.
HEATER FOR WATER.

APPLICATION FILED OCT. 1, 1902.

NO MODEL.

2 SHEETS—SHEET 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

ARTHUR WILHELM EKSTRÖM, OF STOCKHOLM, SWEDEN.

HEATER FOR WATER.

SPECIFICATION forming part of Letters Patent No. 755,366, dated March 22, 1904.

Application filed October 1, 1902. Serial No. 125,478. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR WILHELM EKSTRÖM, engineer, a subject of the King of Sweden and Norway, and a resident of Storgatan 44, Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Heaters for Water and other Liquids, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to heaters especially intended for feed-water heating.

The main object of the invention is to arrange the said device in such a manner that all the tube-sections of the heater will be blown off simultaneously, completely, and uniformly.

In the accompanying drawings, Figure 1 is a side elevation and partial section of a heater for water arranged in accordance with this invention. Fig. 2 is a horizontal section on line *x x* of Fig. 1, and Fig. 3 is a transverse section on line *y y*, Fig. 1. Fig. 4 illustrates in a plan view a modified form of the heater. Fig. 5 is a side elevation, partly in section, of another modified form of the heater. Fig. 6 is a section on the line 6 6 of Fig. 5, and Fig. 7 is a transverse section on the line 7 7 of Fig. 5. Fig. 8 is a diagrammatic sectional view showing the top and bottom pipes and connections as shown in Fig. 5.

The heater is mounted, as usual, in a flue or passage for fire products. It consists, as shown, of five sections or groups 1 2 3 4 5, each composed of four vertical tubes. These tube-sections communicate at their bottom ends with a horizontal pipe 11 through pipes 6 7 8 9 10 and at the top with a pipe 12 through similar pipes. The pipes 11 12 are composed of sections each having a part with a flat wall for enabling the mounting of return-valves 13 15 14 16 in the pipes 11 12, respectively. The said valves divide the pipes 11 12 into chambers, connecting the tube-sections in pairs 1 and 2 and 3 and 4 alternatively at their bottom ends and at the top. The valves are arranged in such a manner that they are held in closed position by water passing through the heater to the steam-boiler

or other evaporating apparatus, but are all opened when the heater is blown off. Water is forced into the pipe 11 and is caused by the valve 13 to pass from said pipe through the pipe 6 into the first tube set or section 1, through which it passes in an upward direction. The water passes from said tube-section 1 into the upper pipe 12, from which it passes freely downward through the section 2. The return-valve 14 in the upper pipe 12 prevents the continued passage of the water through the pipe 12 and descending through the next section 3. The water passes from the tube-section 2 into the lower pipe 11 and is caused by the valve 15, mounted between the tube-sections 3 and 4, to enter the section 3 and to pass upward through the same. It is then caused, by means of the valve 16, to pass downward through the tube-section 4, from which it passes again into the pipe 11, afterward ascending through the tube-section 5. The water passes from the last-mentioned tube-section again into the pipe 12 and then into the steam-boiler. The lower pipe 11 is provided at its inlet with a branch pipe 17, having a cock or valve and which is preferably controlled by hand. As seen from the accompanying drawings, the water is caused by the return-valves to ascend in the heater through alternate tube-sections 1, 3, and 5 and to descend through the intervening tube-sections 2 and 4. When blowing-off is to be effected, the feed of the water is interrupted and the valve of the branch or blowing-off pipe 17 is opened, the return-valve 50, mounted between the heater and the steam-boiler, being then automatically closed. As seen from Fig. 2, the water passes during the operation of the heater through the same in a direction opposite to that of the fire products, in consequence whereof the water will have its highest temperature in the last tube-section 5. As this temperature, generally not below 120° centigrade, during the operation of the heater is beyond the boiling-point owing to the pressure, steam will be generated in the top of the last sections 5 4 as the valve in the pipe 17 is opened and the pressure in the heater is reduced, which steam opens

the valves 16 14 and is equally distributed throughout the upper part of the heater. The additional pressure thereby generated in the upper part of the heater effects a complete blowing-off of all the tubes simultaneously. The valves 15 13 will also be opened by the said additional pressure and form no obstacle for the uniform blowing-off of the heater.

In the modification shown in Fig. 4 the top valves are dispensed with, narrow pipes or passages being substituted for the same. The said pipes or passages continuously connect the aforesaid chambers or pipe-sections, communicating with the tube-sections in the manner stated above. In Fig. 4 the said chambers or pipe-sections consist of U-shaped pipes 18 19. A narrow pipe 20 communicates with the said pipes 18 19 and with the top of section 5. The pipe 20 is so narrow that the small quantities of water passing through the same from section to section have no influence upon the operation of the heater. During the blowing-off of the heater steam is generated in the top of the last sections 5 4 by reasons stated above, which steam is easily distributed in the whole upper part of the heater through the narrow pipe 20, pressure being thus generated in the said part and the blowing-off effected in the manner stated. At the bottom the heater is arranged as shown in Figs. 1 to 3.

In the modification shown in Figs. 5, 6, and 7, 11 designates the bottom pipe, connected with the inlet, and 12 the top pipe, communicating with the steam-boiler or other evaporating apparatus. The pipe 11 is divided into chambers 21 22 23 24 25 by means of return-valves 26, 27, 28, and 29, the last chamber 25 being closed by an end wall 30. The top pipe 12, the right end of which is closed, is divided into chambers 31, 32, 33, 34, and 35 by means of return-valves 36, 37, 38, and 39. The tube-sections 1, 2, 3, 4, and 5 communicate at their bottom ends with each chamber 21, 22, 23, 24, and 25 through the pipes 6, 7, 8, 9, and 10, mentioned above, and at the top with each chamber of the pipe 12 through similar pipes. The chamber 31 communicates with the chamber 22 through a pipe 40, situated outside the flue. The chamber 32 communicates with the chamber 23 through a pipe 41. Similar pipes 42 and 43 connect the chambers 33 and 24 and 34 and 25. The water passes from the chamber 21 through the pipe 6 into the tube-section 1 and passes upward through the same. From the said tube-section the water passes into the chamber 31, from which it passes down through the pipe 40 and enters the chamber 22. From the said chamber 22 the water ascends through the tube-section 2 and enters the second top chamber 32. The pipe 41 leads the water from the chamber last mentioned into the next bottom chamber 23, and so on, so that the water passes upward through the tube-sections 1, 2, 3, 4, and 5 and downward through the pipes 40 41 42 43 outside the heater.

17 is the blowing-off pipe. When blowing off is to be effected, for which purpose the valve in the pipe 17 is opened, steam will be generated in the last tube-sections 5 4, which steam opens the valves 39, 38, 37, and 36 and is distributed throughout the upper part of the heater, thus effecting a complete blowing off of all the tube-sections simultaneously in the same manner as stated above. It will be easily understood that narrow passages or pipes may be substituted for the top return-valves 36 37 38 39 in a manner similar to that shown in Fig. 4.

In the heaters described above the tube sections or groups may be altered as required and the number of tubes in each section may be greater or less than that shown in the drawings. The heater may be employed for other liquids than water.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a heater for liquids, the combination with tubes in groups, a top pipe having a separate compartment for each group of tubes and a bottom pipe common to all the groups of tubes permitting the liquid to circulate through the heater, of means for automatically connecting all the said compartments in the top pipe, thereby permitting the steam-pressure to be uniformly distributed in the upper part of the heater, substantially as described and for the purposes set forth.

2. In a heater for liquids, the combination with tubes in groups, a top pipe having a separate compartment for each group of tubes and a bottom pipe having a separate compartment for each group of tubes, thereby permitting the liquid to circulate through the heater, of automatic return-valves in each of the said compartments in the top pipe whereby the steam-pressure may be uniformly distributed in the whole upper part of the heater and automatic return-valves in each of the said compartments in the bottom pipe, substantially as described and for the purposes set forth.

3. In a heater for liquids, the combination with tubes in groups, a top pipe having compartments for the groups of tubes and a bottom pipe common to the groups of tubes, permitting the liquid to circulate through the heater, of means for automatically connecting all the said compartments in the top pipe, thereby permitting the steam-pressure to be uniformly distributed in the upper part of the heater, substantially as described and for the purposes set forth.

4. In a heater for liquids, the combination with tubes in groups, a top pipe having compartments for the groups of tubes and a bottom pipe having compartments for the groups of tubes thereby permitting the liquid to circulate through the heater, of automatic return-valves in each of the said compartments

in the top pipe whereby the steam-pressure
may be uniformly distributed in the whole
upper part of the heater and automatic return-
valves in each of the said compartments in
5 the bottom pipe, substantially as described
and for the purposes set forth.

In witness whereof I have hereunto signed

my name in the presence of two subscribing
witnesses.

ARTHUR WILHELM EKSTRÖM.

Witnesses:

R. APELGREN,

AUG. SÖRENSEN.