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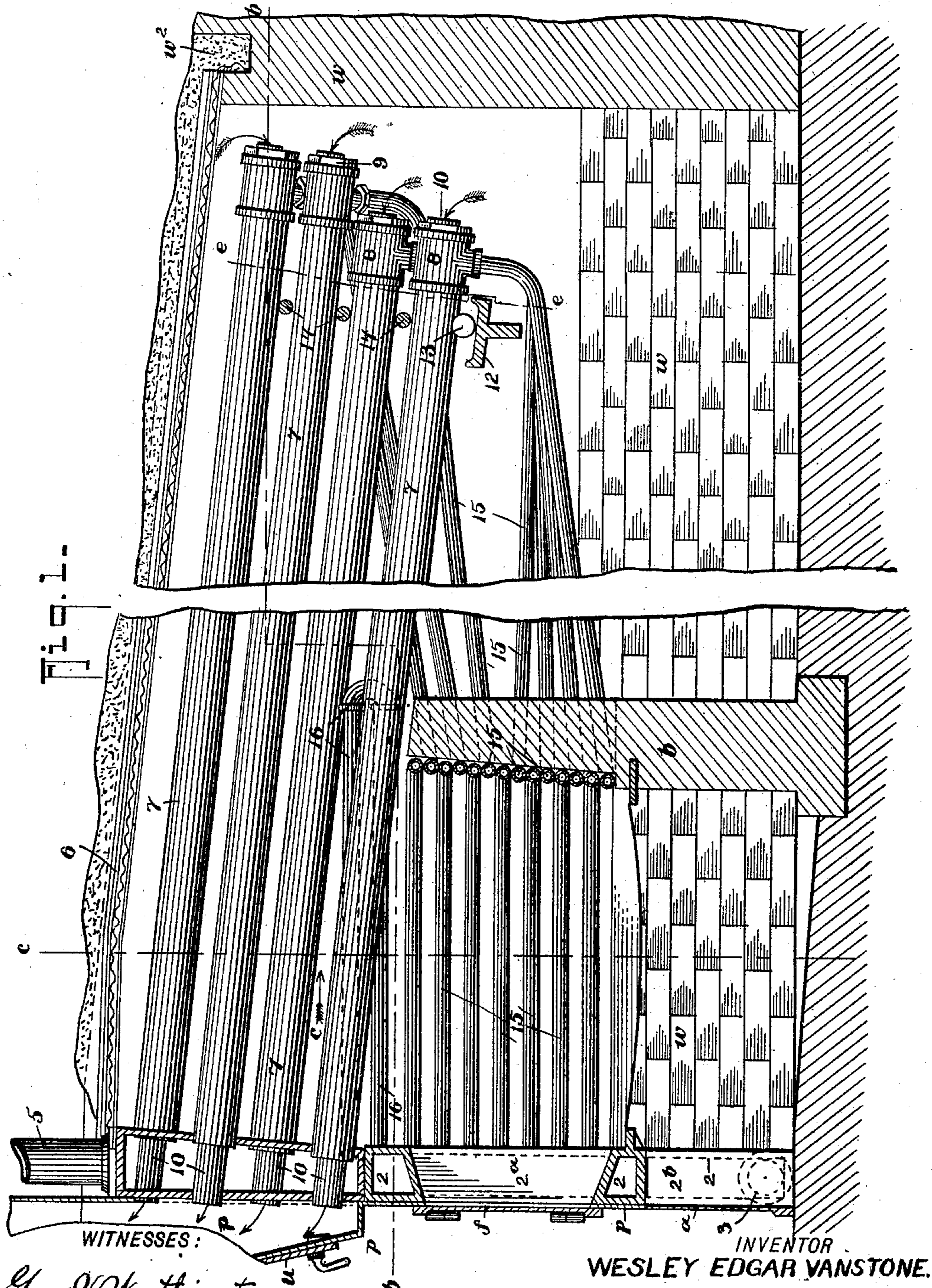
Patented July 15, 1902.

W. E. VANSTONE.
HEATER.

(Application filed Sept. 25, 1901.)

(No Model.)

3 Sheets—Sheet 1.



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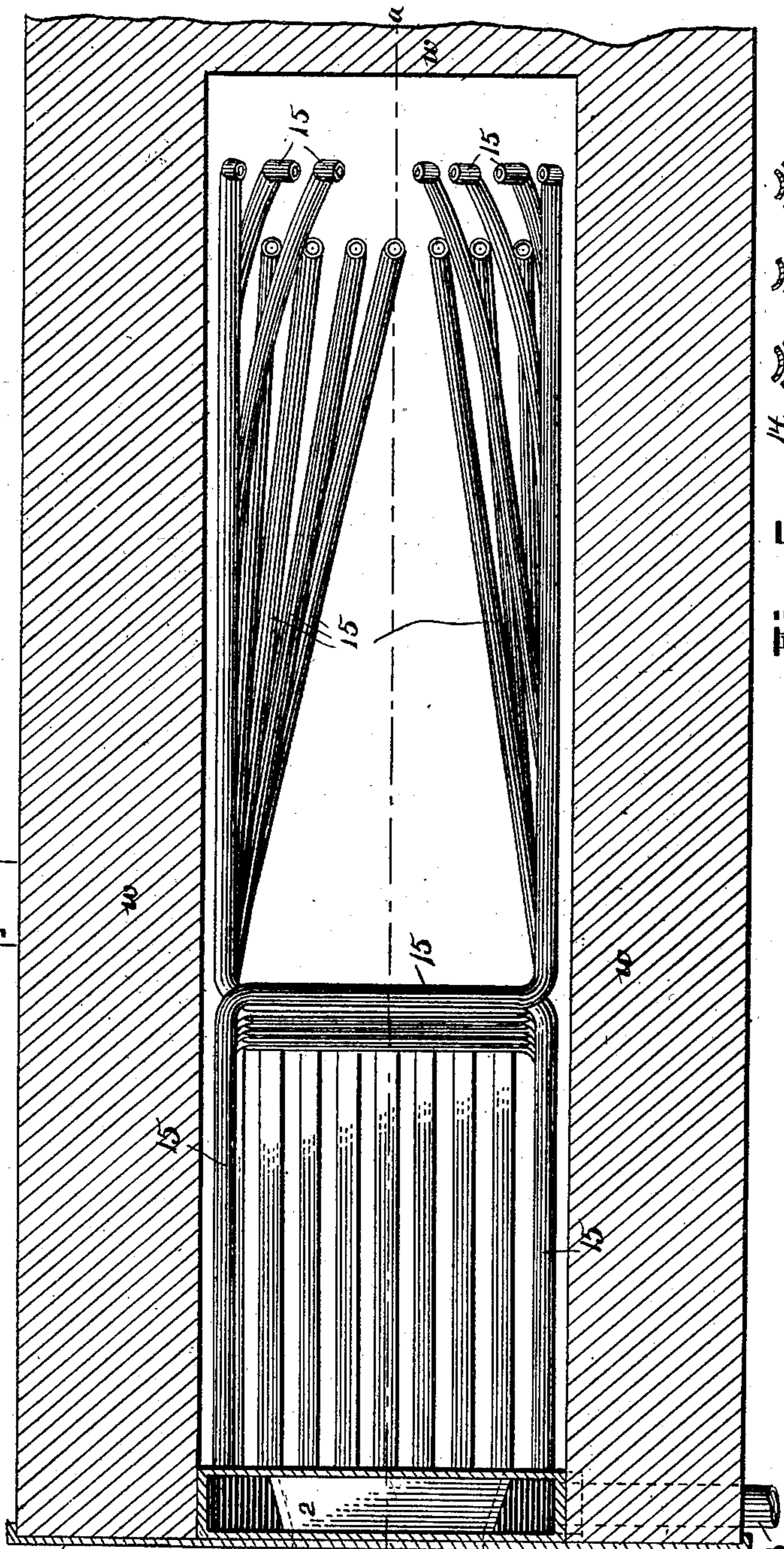
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Fig. 2



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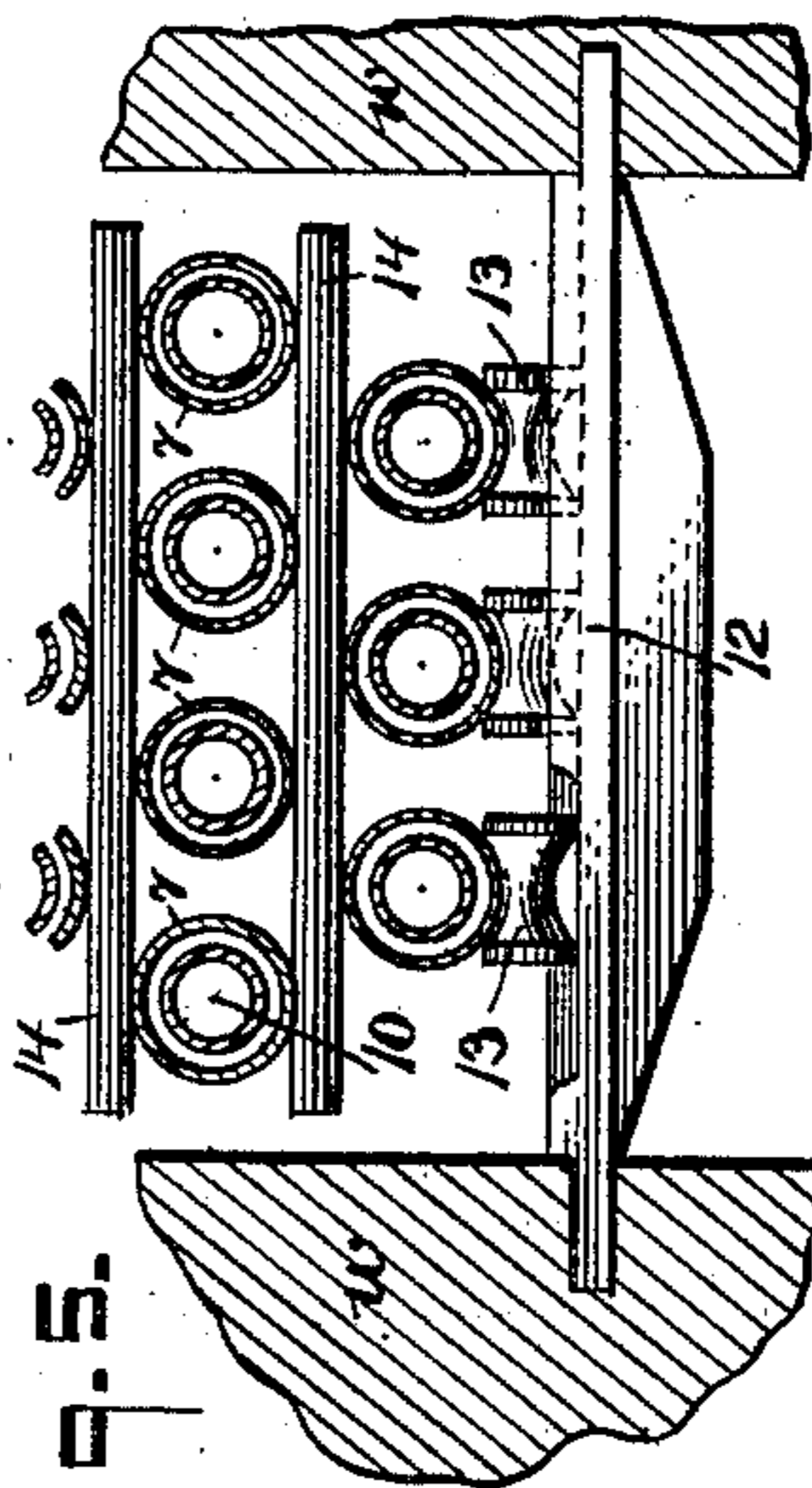


Fig. 5.

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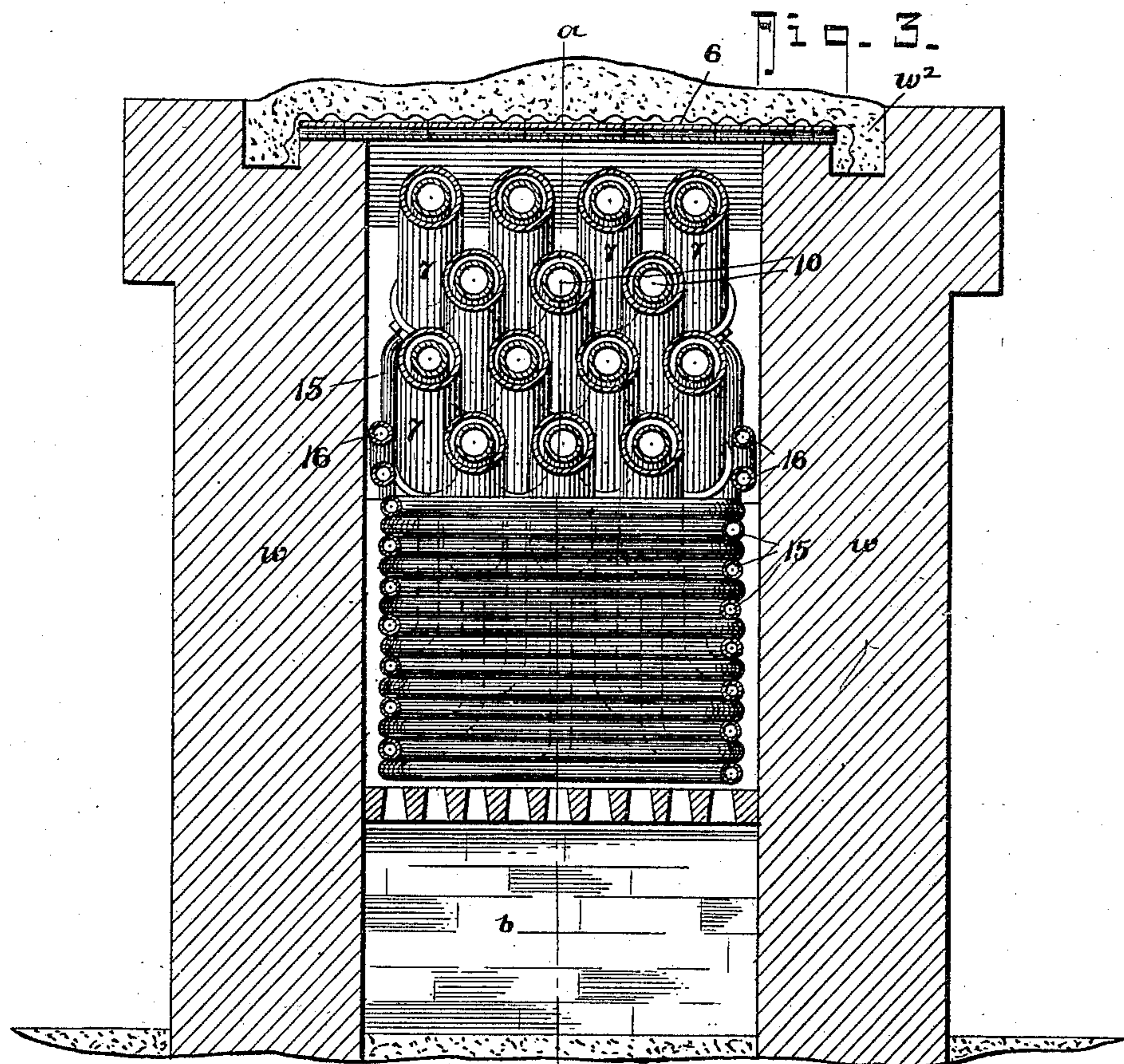
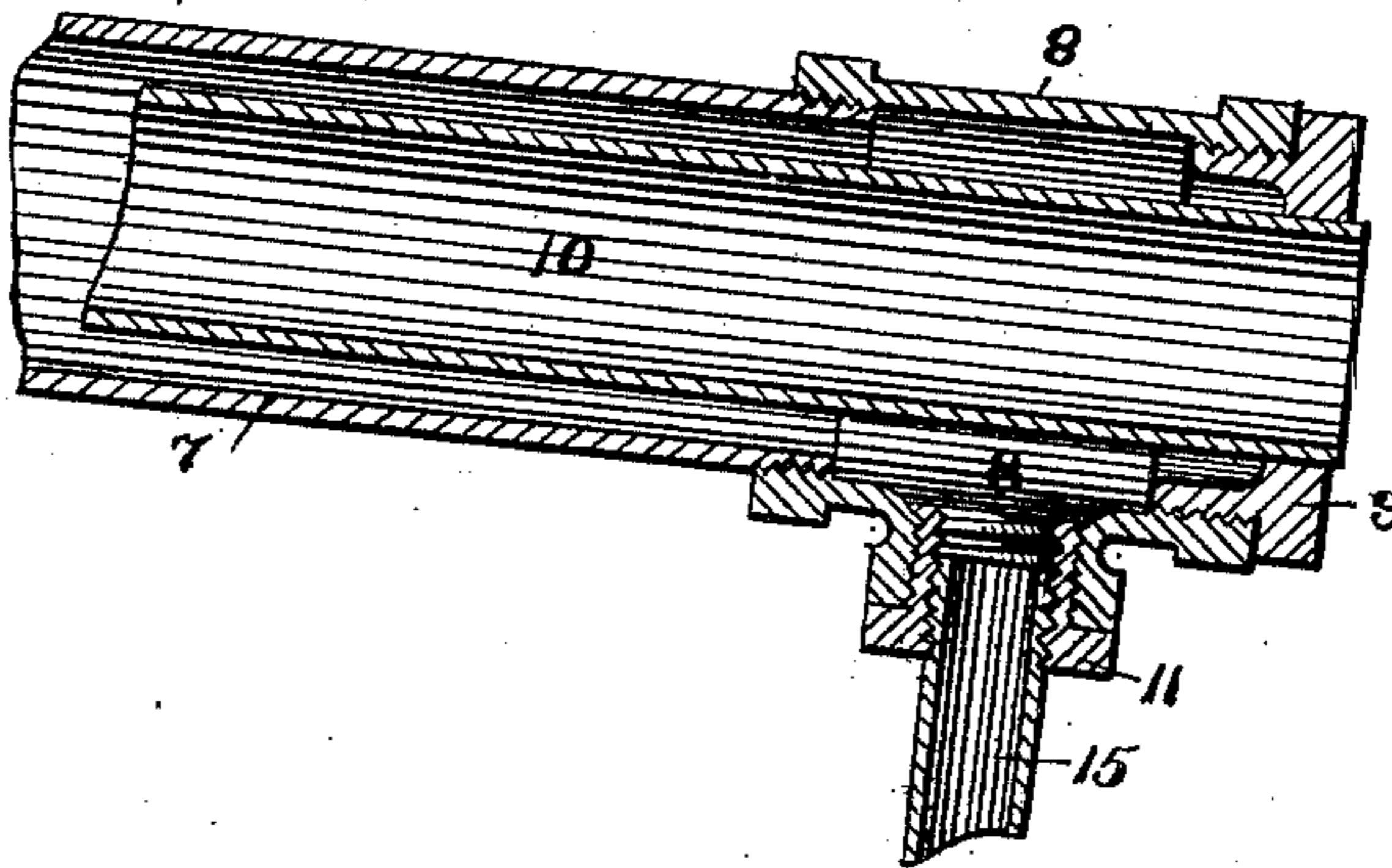
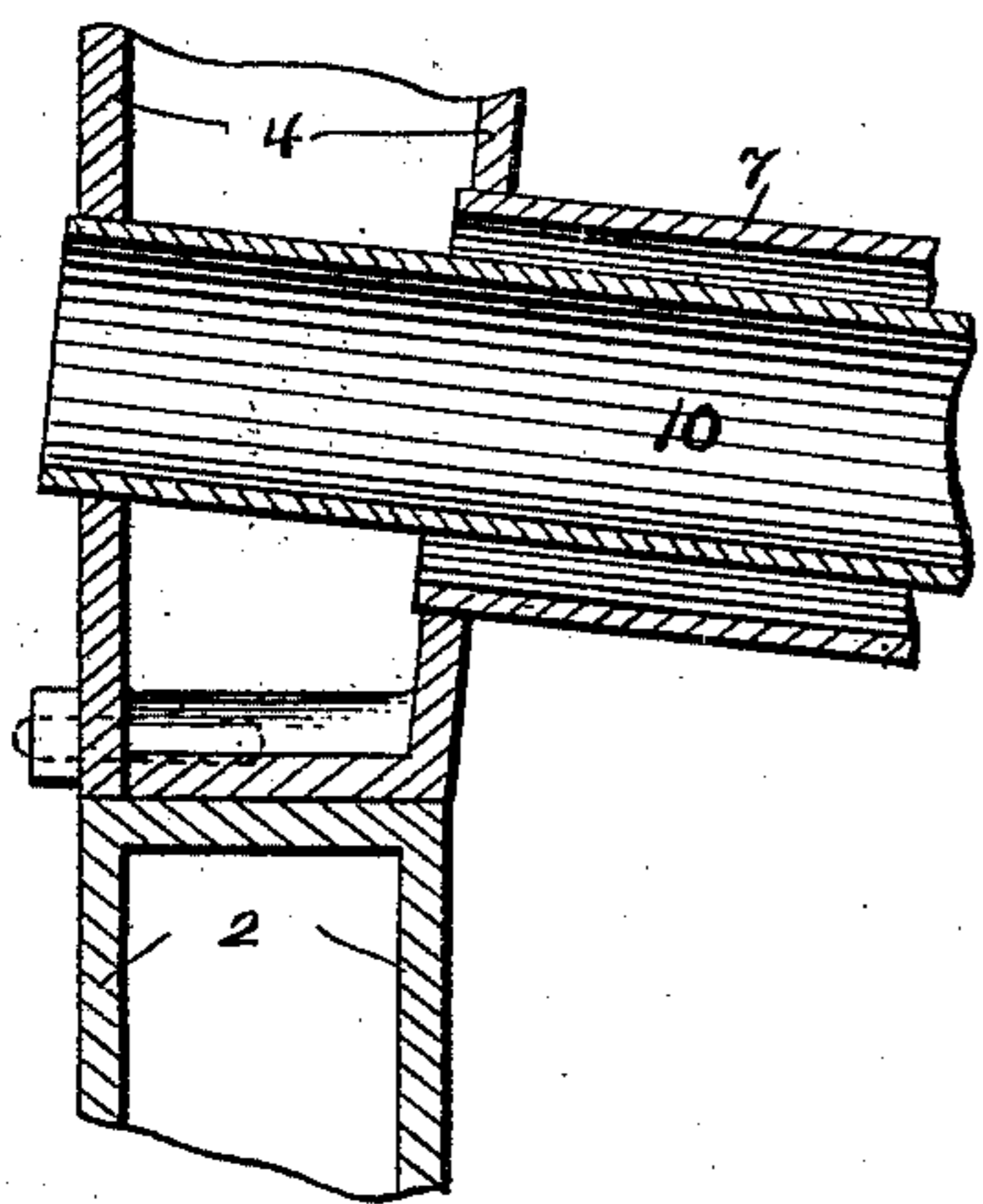


Fig. 4.



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UNITED STATES PATENT OFFICE.

WESLEY EDGAR VANSTONE, OF NEW WESTMINSTER, CANADA.

HEATER.

SPECIFICATION forming part of Letters Patent No. 704,988, dated July 15, 1902.

Application filed September 25, 1901. Serial No. 76,572. (No model.)

To all whom it may concern:

Be it known that I, WESLEY EDGAR VANSTONE, a citizen of the Dominion of Canada, residing at New Westminster, in the Province of British Columbia, Canada, have invented a new and useful Water-Heater, of which the following is a specification.

My invention relates to improvements in water-heaters, and though especially designed for the heating and circulation of water for the warming of public buildings is equally applicable to any case where an economic water-heater is required, or, with certain modifications, which shall be the subject of further patents, it will form an efficient steam-generator.

My heater has the following distinctive features in its design: First, the attainment of a large area of the most effective heating-surface within a small compass and extremely low height, enabling it to be advantageously used in low basements; second, the absolute freedom for expansion of its parts, thus avoiding the destructive straining action to which such heaters are commonly exposed; third, the positive circulation of the water from inlet to outlet, there being no redundant circulation or dead-water; fourth, the continuous upward progress of its circulation; fifth, the exposure of the water as it leaves the heater to the greatest heat of the furnace; sixth, the long fire travel, whereby all available heat is abstracted from the products of combustion; seventh, its adaptability to any kind of fuel, and, lastly, the facility with which access can be had to the entire heating-surface for cleaning, examination, or repair.

My device is fully illustrated in the drawings herewith, in which—

Figure 1 is a vertical longitudinal section on the line *a a* in Fig. 2. Fig. 2 is a plan on the line *b b* in Fig. 1, the flue-tubes, &c., being removed to show the fire-box tubes clearly. Fig. 3 is a vertical cross-section on the line *c c* in Fig. 1 looking in the direction of the arrow C. Fig. 4 is an enlarged detail section of one of the flue-tubes and its connection with the outlet-header. Fig. 5 is a cross-section on the line *e e* in Fig. 1, showing the support of the flue-tubes and their expansion-rollers.

In the drawings, *w w* represent the in-

closing wall of the furnace and flue. The bridge-wall *b*, supporting the furnace-bars and inclosing the ash-pit and being carried up centrally, forms a backing for the tubes which constitute the bridge-wall of the furnace.

Forming the front end of the furnace-chamber and extending to a suitable distance above the fire-bars is the hollow inlet-header 2, through which are the openings 2^a and 2^b to ash-pit and furnace, respectively, and to the lower corner of which on either side the inlet-pipe 3 is connected.

Immediately above the inlet-header 2, and resting on its upper edge, but not communicating directly with it, is the outlet-header 4, having the outlet-pipe 5 attached to its upper side. These two headers together form the closure of the front end of the furnace-chamber, save where the fire and ash-pit doorways are. A plate front *p* covers the junctions of the headers to the brickwork and carries the doors *f*, *a*, and *u* of furnace, ash-pit, and uptake. Thus the chamber is inclosed, and the only escape therefrom of the furnace-gases is provided in the flue-tubes about to be described.

Expanded or otherwise secured in apertures provided in the inner wall of the outlet-header 4 are a series of tubes 7, which extend rearwardly with a suitable downward slope to the farther end of the flue-chamber, and at the extreme end each tube is secured in a T-fitting 8, (see Fig. 4,) in the farther end of which is a reducer or bushing 9, adapted to receive the inner or flue tube 10. These tubes 10 pass through the entire length of 7 and at the other end pass through the water-space of the header 4 and are expanded into apertures in the outer wall of it. The overhanging ends of these tubes are supported on the cross-beam 12, the lower row on grooved rollers 13, and the upper ones on interposed rollers 14 between each row of tubes.

In the inner wall of the inlet-header 2 are secured the furnace-tubes 15, arranged in a vertical row on each side of the furnace, to which they form the side walls. These tubes at the end of the furnace are bent across from right to left and from left to right alternately, (see Fig. 2,) and resting one on the other form a close bridge-wall diverting the

flame up among the flue-tubes 7. The tubes are thereafter again bent and are continued toward the back of the flue-chamber, where each is connected to its respective branch 8^a of a flue-tube-jacket T 8 by a right and left thread reducer 11.

From the top of the inlet-header 2 to the bottom of the outlet-header 4 I provide at each side a return-bend 16, the object of which is to carry water already heated by a more direct connection to the outlet-header instead of requiring it to traverse a fire-box pipe and flue-tube jacket.

I may, if found desirable, have the tubes 15 of a diameter larger than one-half their pitch apart and flatten them slightly where the right and left hand tubes are superposed at the bridge-wall, or I may stagger them both in the sides and at the crossing.

The circulation of the water and the course of the furnace-gases will now readily be understood.

The furnace is surrounded entirely by the water-surfaces of the headers and tubes, which latter are at the sides close to the brick lining and at the bridge-wall are designed to form a close barrier and divert the flame and products of combustion up among the jacketed flue-tubes, along and among which the hot gases must travel toward their exit through the tubes 10 to the uptake, while the gradual upward slope of the water-current is designed to give a sufficient circulation which will be proportioned to the briskness of the fire. Thus if the water heats quickly it will circulate more rapidly.

The flue-tubes 10 can be readily brushed out from the front end, the door *u* being provided in the uptake for the purpose, while the sand being swept aside the top cover can be readily removed to permit of the exterior of the tubes being cleaned, examined, or repaired.

The whole pipe system will expand rearwardly from the headers and an approximately equal amount, any variation there may be being permitted without undue straining by the right-angle bends in the furnace-pipes and the system of independent rollers for each row of flue-tubes.

Having now particularly described my invention, what I claim as new, and desire to be protected in by Letters Patent, is—

1. In a water-heater as described, a hollow inlet-header forming the front of the furnace-chamber and having an inlet-pipe through which water is introduced; a similar outlet-header above and resting on the foregoing, provided externally with a smoke-uptake and having an outlet-pipe for the conveyance of the heated water; a flue-chamber, a series of water-jacketed flue-tubes communicating from the rearward end of the flue-chamber through the outlet-header to the uptake, the

water-jackets being in connection with the water-space of the outlet-header; and means whereby each rearward end of the flue-tube water-jackets may be connected to the water-space of the inlet-header by pipes forming the sides and back of the furnace.

2. In a water-heater of the class described, having a furnace and flue chamber inclosed; a hollow inlet-header forming the front of the furnace and adapted to receive the return water; a similar outlet-header resting on the foregoing, adapted to receive the water when heated and deliver it to the exterior distributing-pipes; a series of flue-tubes adapted to convey the products of combustion from the rearward end of the flue-chamber through the outlet-header to the smoke-uptake; exterior tubes surrounding such flue-tubes and forming a water-jacket therefor from the inner wall of the outlet-header to the rearward end of the flue-tube; a series of pipes fixed in the inner wall of the inlet-header on each side of the furnace-doorway, and passing along on each side of the furnace bent across each to the opposite side at the back of the furnace and thence proceeding and being connected to the rear end of the flue-tube jackets so that water may be continually circulated through furnace-tube and jacket from inlet to outlet header, and a return-bend pipe on each side from the upper part of the inlet to the lower part of the outlet headers, substantially as described.

3. In a heater as described having a hollow header from which project a series of jacketed flue-tubes to within the flue-chamber; a cross-beam below the farther end of such tubes; grooved rollers on such beam supporting the tubes, and intermediate rollers between each horizontal row of tubes, whereby the overhanging weight of the tubes is supported while they are free to expand and contract freely.

4. In a water-heater as described, in combination, the inlet-header 2, surrounding the furnace and ash-pit doorways and forming the front of the furnace; and the outlet-header 4 surmounting the same, the flue-tube 10, and the jacket-tube 7, the terminal T's 8; junction-sleeves 9, water-tubes 15, secured in the inlet-header and passing along the sides and across the back of the furnace, and thence to the terminal T of the jacket-tubes; junction-bushings 11, return-bends 16, connecting the upper side of the inlet with the lower side of the outlet headers on each side of the furnace, substantially as described.

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

WESLEY EDGAR VANSTONE.

In presence of—

ROWLAND BRITAIN,
ELLICE WEBBER.