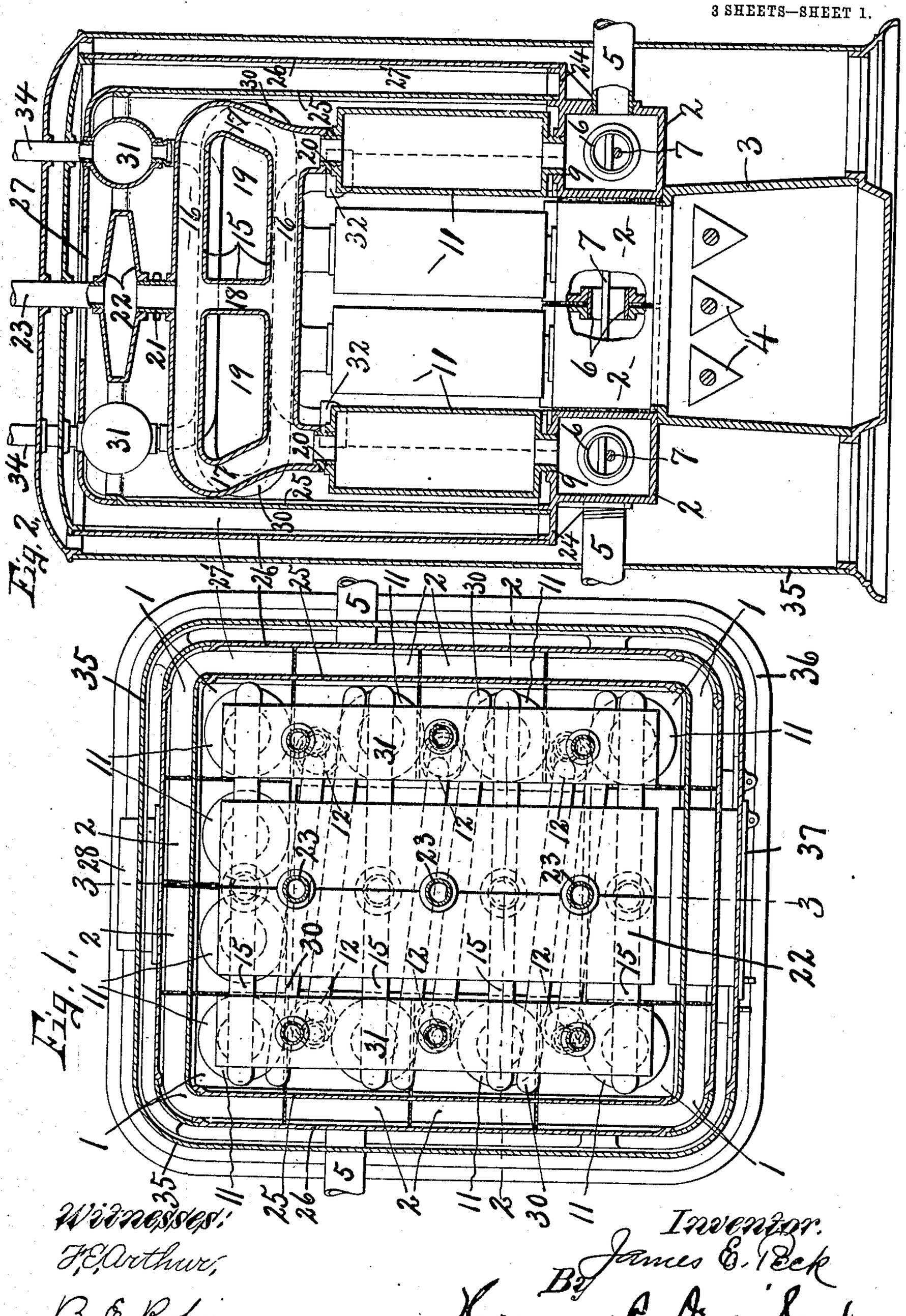
No. 871,235. PATENTED NOV. 19, 1907.

J. E. PECK.

HEATER.

APPLICATION FILED AUG. 21, 1905.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 3.

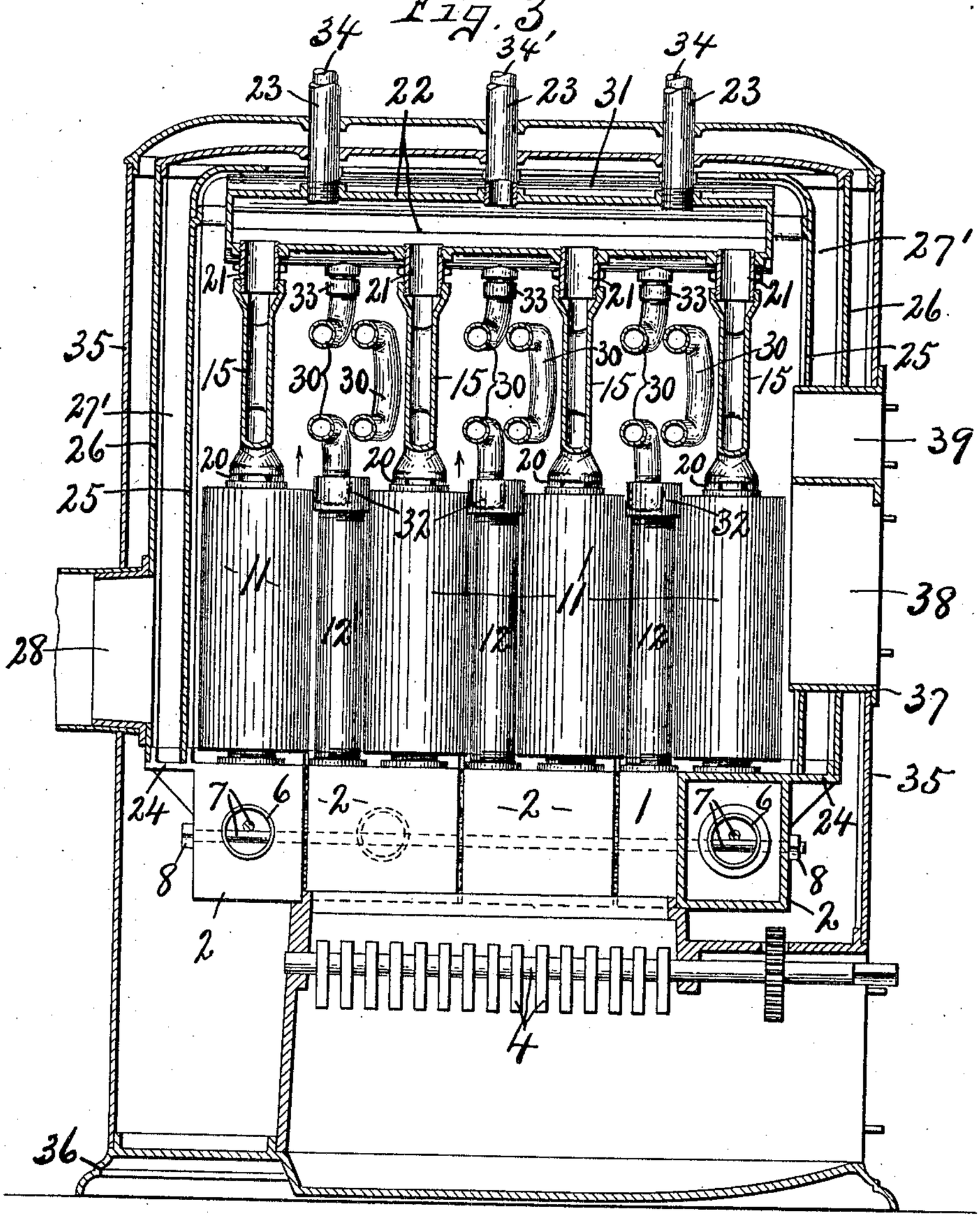

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Fig. 4.

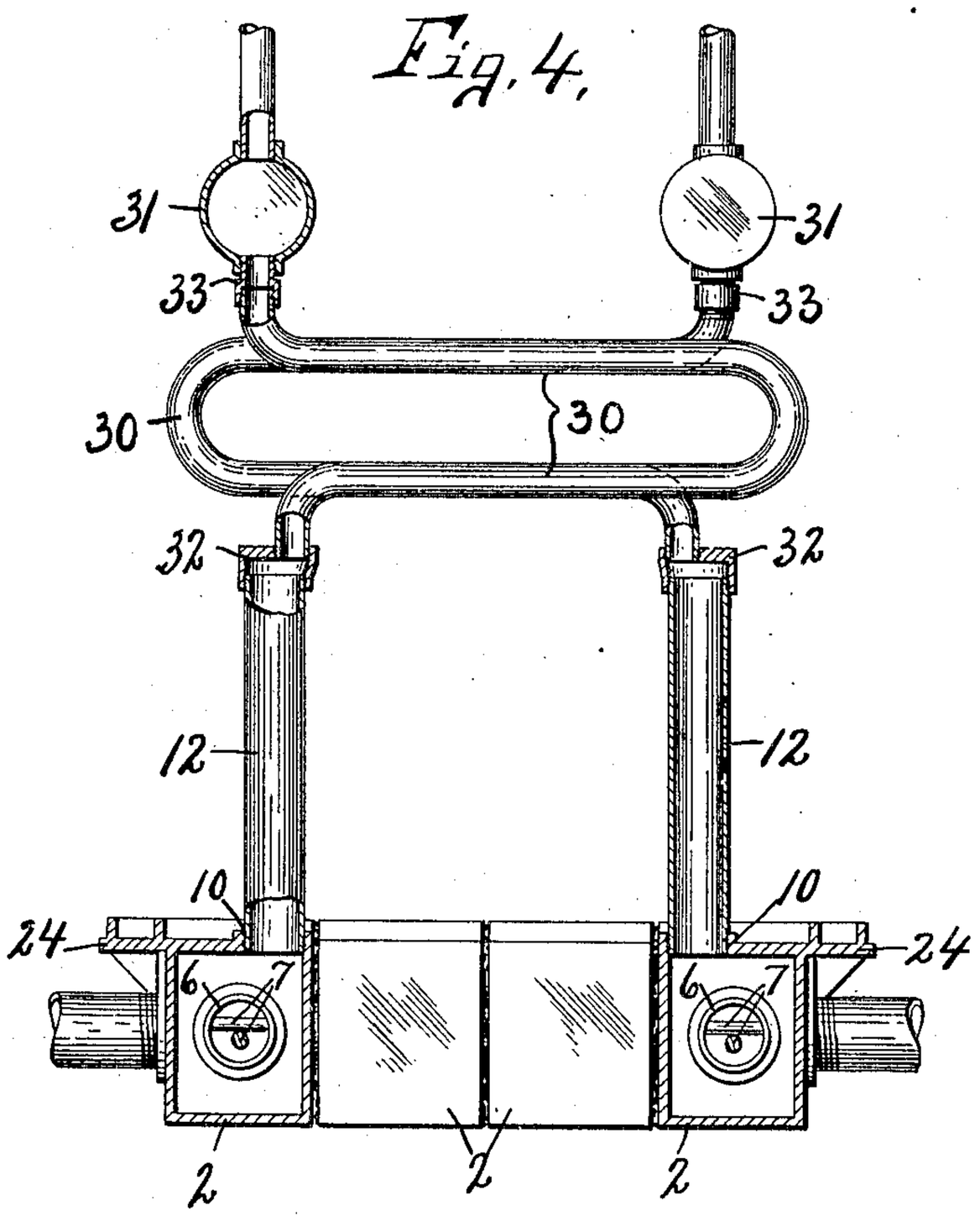
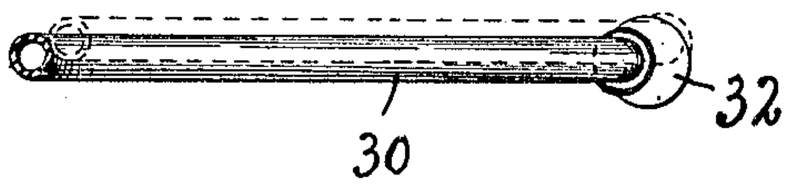


Fig. 5.



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THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES E. PECK, OF SYRACUSE, NEW YORK.

HEATER.

No. 871,235. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed August 21, 1905. Serial No. 275,090.

To all whom it may concern:

Be it known that I, JAMES E. PECK, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Heaters, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to improvements in heaters, and refers more particularly to hot-water or low-pressure steam circulating systems, or to a combined steam and hot-water system in which a hot water circulation may be maintained in one set of pipes or radiators, and low-pressure steam in another part of the system in a manner similar to that set forth in my Patent No. 789,231, May 9, 1905.

The essential objects, however, of my present invention are, first, to provide the heater with a water-base composed of hollow sections arranged end to end in the form of a rectangular parallelogram forming a part of the combustion chamber and communicating with each other so that the size of the fire-box may be varied by simply adding or removing one or more sections in the width or length, or in both width and length of the water-base; second, to provide each section with one or more upwardly projecting water legs, and when more than one is used, to make one of them very much smaller in diameter than the other, and to connect all the smaller ones to one distributing head, while the larger water legs are connected to a separate distributing head, whereby two separate circulating systems can be maintained from the same heater.

The third object is to connect the upper ends of opposite water legs across the combustion chamber by means of a conduit having two or more intercommunicating passages, said conduits being spaced apart to form intervening fire-passages so that the upright water-legs and their communicating conduits at the top are practically enveloped in the products of combustion, the same being true of the distributing heads previously described.

A further object is to connect the upper ends of the smaller water legs with their respective distributing heads by means of bent pipes and to couple these pipes with their respective water legs by means of right and left-hand couplings, in which one of the threaded sockets is eccentric with relation to the other socket, so that by turning the coupling one way the other end of the pipe may be more accurately registered with its opening in the distributing head to which it is adapted to be connected.

Other objects and uses will appear in the following description.

In the drawings—Figure 1 is a top plan of my improved heater, the upper portion of the case or inclosing jackets being broken away to show the relative position of the interior water-legs, distributing heads and water pipes. Figs. 2 and 3 are respectively transverse and longitudinal vertical sectional views of the heater seen in Fig. 1, taken respectively on lines 2—2 and —3—3, Fig. 1. Fig. 4 is a transverse vertical sectional view through the water-base showing the smaller upright water legs and distributing heads and the bent pipes by which said water-legs are connected to the respective heads. Fig. 5 is a top plan of one of the water legs and the circulating pipe leading from its upper end showing the eccentric right and left hand coupling by which said water pipe is united to its upright water leg.

The water-base is made in the form of a rectangular open frame forming within its walls a portion of the combustion chamber and consisting essentially of four corner sections —1— and any number of intermediate sections —2—, all of which are hollow and of substantially the same cross sectional form and are arranged end to end to form the rectangular open frame, previously described. These several water-base sections —1— and —2— are mounted in a horizontal plane upon the top of a suitable rectangular ash-box —3— directly above the grates —4— and communicate with each other through suitable openings in their adjacent or contiguous sides which are fitted upon and held in place by connecting nipples —6—, as best seen in Fig. 2. These nipples —6— are of ample size to allow rapid circulation of the water through the several sections successively which is provided with one or more of the return flow conduits —5, of the hot water circulating system.

It will be observed upon references to Figs. 2 and 3, and 4, that the communicating openings between the several sections of each side of the water-base are registered with each other, and while the adjacent sections are united to each other by the connecting nipples —6—, they are further clamped together by tie-rods —7— running longitudi-

nally and transversely through the alined nipples —6— of each side of the water base, as best seen in Figs. 2, 3, and 4, and the ends of each tie-bolt are passed through comparatively small apertures in the outer walls of the corner-sections —1— and receive suitable nuts or washers —8—, Fig. 3, by which the sections at each side of the water base are firmly drawn together and upon the nipples —6—, which are preferably tapering. The top of each of the water-base sections —1— and —2—, except one or more at the front, is provided with one or more threaded openings —9— and —10— in which are screwed the lower ends of an upright water leg —11— of comparatively large diameter, and a second upright water leg —12— of comparatively small diameter.

As best seen in Fig. 1, only the front corner sections —1— and intermediate side sections —2— are equipped with small water legs and these are arranged between the larger water legs so that the large and small ones alternate with each other along the sides of the combustion chamber, from front to rear, and together, form the sides and rear of the combustion chamber some distance above the water-base.

It will be seen upon reference to Fig. 1, that each side of the water-base is provided with the same number, in this instance, four of the larger upright water-legs and that the rear intermediate section —2— is provided with a plurality of, in this instance two, of the larger water legs, and in view of the symmetrical arrangement of these several water-base sections and their tubular uprights, the latter are directly opposite to each other at opposite sides of the combustion chamber and the upper ends of the larger water legs of each pair are connected by a transverse conduit —15— having two substantially parallel transverse water-ways —16—, one above the other and connected at the ends and at the center by vertical ways —17— and —18—, said conduit 15— having fire passages —19— therethrough from front to rear between the transverse passages —16— and at opposite sides of the central passage —18—. It will be seen that the lower ends of the upright tubes or water-legs —11— are reduced in diameter and that these reduced ends are threaded and screwed directly into the top of each section.

The conduits 15, which are preferably made of cast-iron have their opposite ends connected to the upper ends of their respective heads by nipples —20— having right and left-hand threads screwed into the adjacent ends of the upright water-legs —11— and conduit 15—, and therefore, there are a series of these conduits traversing the combustion chamber in parallel planes, one in advance of the other from front to rear corresponding in number to the number of the water legs on one side of the heater, thus constituting a series of independent circulating systems within the combustion chamber, each system comprising opposite water-base sections and the water-legs —11— rising therefrom, through which the water rises into the opposite ends of the conduit —15— and may circulate in either direction through the passages —16— and —18—. These several conduits —15— are connected centrally at the top by right and left-hand threaded nipples —21— to a comparatively shallow, but broad distributing head —22— which extends from front to rear of the heater and constituting a steam dome when the device is used as a steam heater, said distributing head being provided with one or more upwardly projecting distributing pipes —23— to be continued to any part of the building to be heated.

One of the particular advantages of this construction of heater is that the water legs —11— are entirely enveloped in the products of combustion and are free to expand vertically independently of each other, thereby obviating any liability of straining or producing leaks at the joints and that these water legs are connected in pairs by the conduits —15—, thereby stiffening, in a measure, the upper ends of each pair against lateral strains and at the same time allowing a certain degree of flexibility for the expansion and contraction of these connected parts without liability of opening the joints. Furthermore, by connecting the water legs in pairs by means of the conduits —15—, and then connecting the conduits longitudinally of the heater to the distributing head —22—, it is seen that the latter materially stiffens the upright water-legs as well as the connecting conduits —15— against longitudinal strains. These elements constitute practically a unitary structure supported wholly within the combustion chamber and entirely surrounded by the products of combustion and owing to the fact that the water-conduits are comparatively shallow and present a large heating area to the fire, it is evident that the cold water will be quickly heated and converted into steam with a minimum consumption of fuel. Another advantage of no less importance is the fact that these water-legs —11—; conduits 15 and distributing head —22— are easily accessible for cleaning and repairing, such parts being easily and quickly assembled and, being made up almost wholly of cast iron it is evident that this boiler may be manufactured at a minimum cost.

The joints between the water-base sections are usually filled in with fire cement to prevent the escape of the products of combustion between them, but owing to the fact that these sections are comparatively shallow and that the lower ends of the water

legs are elevated a slight distance above their top faces, the fire in the combustion chamber is free to contact with the entire inner surface of the water-base and may also pass between the lower sides of the water-legs and top faces of the water-base sections. These several water-base sections are provided with horizontal outwardly projecting flanges —24— forming practically a continuous marginal flange around the upper edge of the water base, and upon this flange are supported an inner cast-iron shell —25— and an outer shell —26—, the inner shell —25— constituting an upright rectangular baffle-plate or casing which entirely surrounds the water-legs —11—, conduits —15— and distributing head —22—, such baffle-plate or casing extending inwardly at the top in which is formed a substantially central opening —27— forming the only means of escape for the products of combustion. It is, therefore, clear that the products of combustion are concentrated entirely within the casing —25— and are caused to travel from the interior of the water-base upwardly and laterally in tortuous paths through the entire height of the heater before they can escape through the opening —27— which is above the distributing head —22—.

The conduits —15—, which extend across the combustion chamber above the water legs tend to retard the upward travel of the products of combustion, thereby causing the fire to impinge against and surround the water legs, and at the same time during the upward progress of the products of combustion more or less pass through the openings —19— in the conduits —15—, thus coming in contact with a large area containing a comparatively small volume of the water, and as the products of combustion continue to travel upwardly they encounter the further resistance of the distributing head —22—, which, being comparatively broad and shallow, lies directly across the outlet opening —26—, and therefore, the products of combustion must practically envelop this distributing head before escaping through the outlet —26—, thereby adding materially to the rapid conversion of the water into steam, if desired. After passing through the central outlet —27— in the top of the casing —25— the products of combustion encounter the top of the jacket or casing —26— and are thereby, deflected laterally and downwardly through an intervening chamber or passage —27'— which entirely surrounds the inner baffle casing —25— and finally escapes at the lower rear side of the casing —26— through a suitable outlet —28.—

The idea of inclosing a series of upright water legs and their transverse connecting conduits, as —15—, and distributing head —22— in a baffle casing which has a single outlet opening centrally in the top above the distributing head is believed to be entirely new, and particularly when used in connection with an additional jacket surrounding the parts just mentioned and having its outlet in the lower end of one side so that the products of combustion are caused to pass from the fire-box in tortuous paths through the top of the baffle-casing and then downwardly around said baffle casing and outwardly at the bottom of the outer jacket. These comparatively large upright water legs —11— and their connecting transverse pipes or conduits —15—, together with the distributing head —22— constitute a generator for one complete circulating system, such as hot water, but in addition to this, I have provided generating means for a separate circulating system which is designed to be more rapid in its action for the purpose of forcing steam or hot water to more exposed or remote parts of the building to be heated. This separate generator includes the water-base sections —1— and —2— and a series of upright water legs 12— of comparatively small diameter arranged between the larger water-legs —11— at the sides of the combustion chamber and having their lower ends screwed into and communicating with the sections —1— and —2—, as best seen in Figs. 1, 3 and 4. These smaller upright water legs —12— are substantially the same height as the larger water legs —11— and the upper ends of these smaller water legs —12— at one side of the combustion chamber are connected by return bend pipes —30— to a distributing head —31—, while the upright water-legs —12— at the opposite side of the combustion chamber are connected by return bend-pipes —30— to a second steam distributing head —31—, these distributing heads 31 and 31— being located at opposite sides of, but in substantially the same horizontal plane as the main distributing head —22— and within the baffle-casing —25—.

In order to economize in the manufacture of this heater and to reduce the number of the joints as far as practicable, the return bend-pipes —30— and 30— are made continuous, or in one piece, as best seen in Fig. 4, the loop formed by each return bend extending laterally across the combustion chamber with one end turned downwardly and the other end turned upwardly. The down-turned end of each return bend pipe —30— and —30— is connected by a right and left-hand threaded nipple —32—, but the threaded socket for receiving the adjacent threaded end of the return bend pipe is arranged eccentric with reference to the threaded socket which receives the upper threaded end of the pipe —12—, and I believe that I am the first to provide a nipple or coupling with right and left-hand threaded sockets, one of which is eccentric with refer-

ence to the other, the object of which is to enable the up-turned threaded ends of all of the return bend pipes for one head, as —31—, to be brought into the same straight line by simply rotating the coupling —32—, the action of which is best seen in Fig. 5. The up-turned end of each of these return bend pipes —30— and —30— is connected by a right and left-hand threaded coupling —33—, as best seen in Fig. 4, and in connecting these pipes —30— and —30— with the upright tubes —12— and heads —31—, the couplings are first screwed upon the upper ends of the pipes —12— and adjacent ends of their respective return pipes —30—, both being drawn together by reason of the right and left-hand threads in the coupling —32—, after which the couplings —32— are rotated slightly, if necessary, to bring the upturned ends of the bend pipes into the same straight line for connection with the head —31—, whereupon these upturned ends are readily attached to the heads —31— by means of the nipples —33—.

Each head —31— and the pipes —30— and water-legs —12— connected thereto constitute the generating parts of separate circulating systems, the heads —31— being provided with upflow pipes —34— which may be extended to any part of the building, (not shown).

The essential parts of the heater previously described are inclosed in an outer jacket —35—, which, together with the ash-box is supported on a suitable base 36.

The front of the casings 25, 26, and 35— are cut away above the water-base to receive a frame —37— having a fuel inlet —38— and a clean-out opening —39—, the fuel inlet being in the horizontal plane of the water-legs, and the clean-out opening is above such plane and in line with the loops or fire passages of the transverse conduits —15— and —30— to facilitate the cleaning and repairing of the interior parts.

The water-base forms the fire-box and practically the whole interior of the casing —25— forms the combustion chamber inclosing the water-legs —11— and 12—; pipes 15— and 30, and heads —22— and 31. The pipes —15— and —30— traverse the combustion chamber from side to side above the water-legs and the heads —22— and —31— extend from front to rear above said pipes which enter their heads from the under side and constitute the only means of support for their respective heads.

In action, the products of combustion rise within and practically envelop all of the water-legs by reason of their being spaced apart from each other and from the water-base, and then encounter the superimposed pipes —15— and —30— which serve as baffles to split up such products and cause them to traverse the entire area of the heater in tortuous paths and to envelop the shallow water channels whereby the water is caused to quickly absorb a large part of the heat in a comparatively short time.

By making the water base in sections and connecting the water legs in the manner described, the capacity or size of the boiler may be increased by adding additional intermediate water-base sections —2— and their water-legs, the ash-box and jackets being accordingly enlarged.

What I claim is:

1. In a hot water heater, a water base composed of hollow sections arranged side by side and constituting a part of the combustion chamber and having inter-communicating passages, a series of upright water legs, each rising from one of the base sections, and separate hollow castings each connecting the upper end of one of the water legs at one side of the combustion chamber with the upper end of the opposite water leg at the opposite side of the combustion chamber, said castings having fire passages therethrough.

2. In a heater, a rectangular base composed of hollow sections arranged side by side forming a part of a combustion chamber and having inter-communicating passages, means for clamping said sections together, a return flow pipe leading to one of the sections, separate upflow pipes leading from said section, and separate one piece hollow castings connecting the upper end of the upflow pipes at one side of the combustion chamber with those at the opposite side of the combustion chamber, each of said castings being provided with transverse fire passages, and separate upflow pipes each leading from the water passage of one of said castings.

3. In a heater, a water base composed of separate hollow sections arranged side by side forming a part of a combustion chamber and having inter-communicating water passages, tie bolts passed through said passages for drawing the sections together, separate comparatively large water legs rising from said sections, additional comparatively small water legs rising from some of said base sections at opposite sides of the combustion chamber, and additional pipes leading from the upper ends of the smaller legs laterally across the combustion chamber, and a return flow pipe leading to one of the base sections.

4. In a hot-water heater, a water base composed of separate hollow sections forming a combustion chamber and having inter-communicating passages, means to clamp the sections together, in combination with water-legs rising from said sections at opposite sides of the combustion chamber, and one piece hollow castings connecting the upper ends of opposite legs across the combustion chamber.

5. In a hot-water heater, a water-base and upright water-legs rising therefrom and forming therewith a combustion chamber and separate cross conduits each connecting the upper end of one leg at one side with one of the legs at the opposite side of said chamber.

6. In a hot-water heater, a water-base and upright water-legs rising therefrom and forming therewith a combustion chamber and separate cross conduits each connecting the upper end of one leg at one side with one of the legs at the opposite side of said chamber, each cross conduit having a fire passage therethrough.

7. In a hot-water heater, a water-base having a return flow opening, water-legs rising from the water-base and forming therewith a combustion-chamber, separate conduits connecting the upper ends of the water-legs at one side with those at the opposite side of said chamber, and a distributing head connected to each of said conduits and having an upflow pipe leading therefrom.

8. In a heater, a rectangular water-base and water-legs rising therefrom and forming therewith a combustion chamber, a baffle-casing surrounding the water-legs and having an outlet in its top, and a second casing surrounding the baffle-casing and forming an intervening fire passage leading from said outlet, said outer casing having an outlet near its lower ends leading from said passage.

9. In a heater, a water base and a baffle casing rising therefrom and having an opening in its top, a jacket surrounding said baffle-casing and having an outlet near its bottom communicating with said opening, a series of water-legs rising from the base within said casing, separate transverse conduits connecting the legs at one side with those at the opposite side of the water-base, and a distributing head connected to the conduits, the water-legs, conduits and head all being below the outlet of and within the baffle-casing.

10. In a heater of the class described, a water base composed of sections arranged side by side and having inter-communicating passages, some of said sections at opposite sides of the combustion chamber having a plurality of water legs of different sizes rising therefrom.

11. In a heater of the class described, a water-base and a series of water-legs rising therefrom, in combination with pipes leading upwardly and laterally from said legs, and couplings therefor, each having eccentric threaded sockets of right and left-hand pitch whereby each pipe may be shifted a limited distance laterally by the turning of the coupling.

12. In a heater of the class described, a water-base and a series of water-legs rising therefrom, in combination with a distributing head, pipes leading from the upper ends of the water legs into said head, and couplings each having eccentric threaded sockets uniting one end of each pipe to its water-leg, whereby the turning of the coupling brings the pipes into proper registration with their openings in the head.

In witness whereof I have hereunto set my hand this 12th day of August 1905.

JAMES E. PECK.

Witnesses:
H. E. CHASE,
MILDRED M. NOTT.