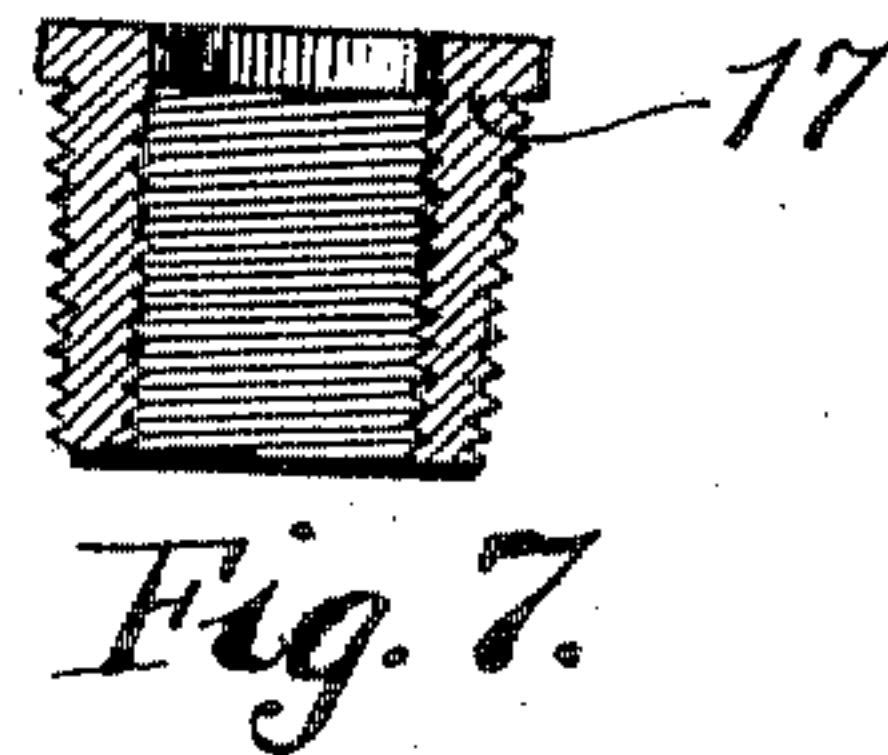
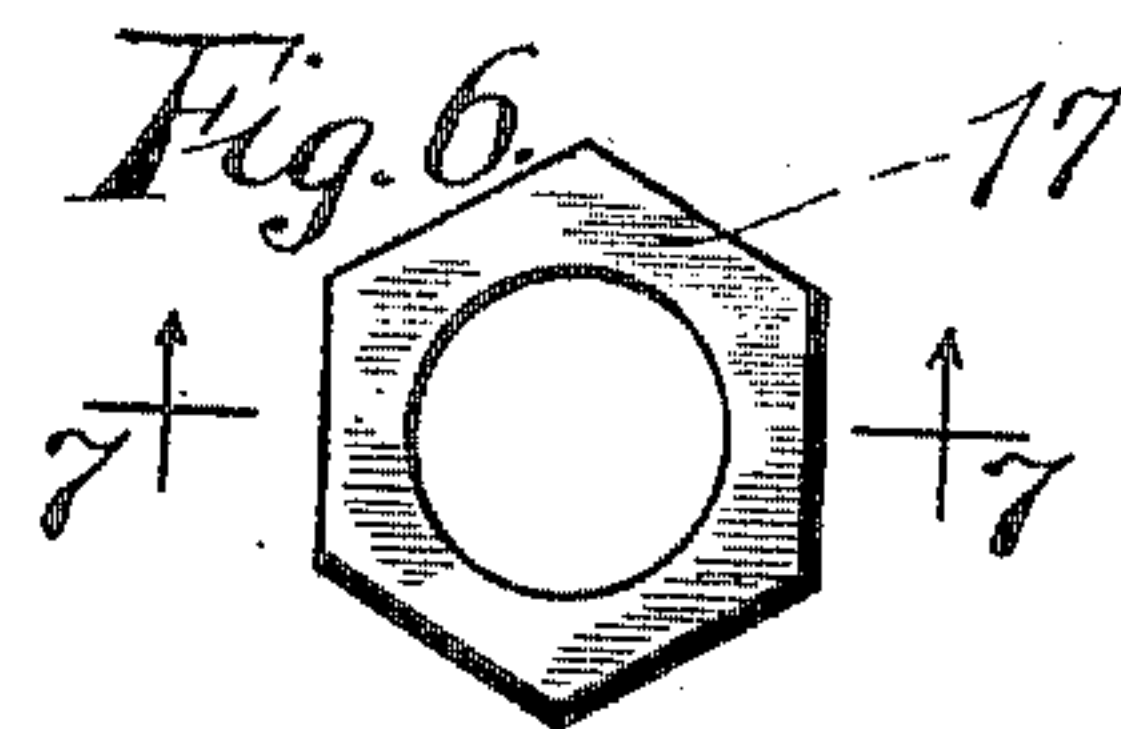
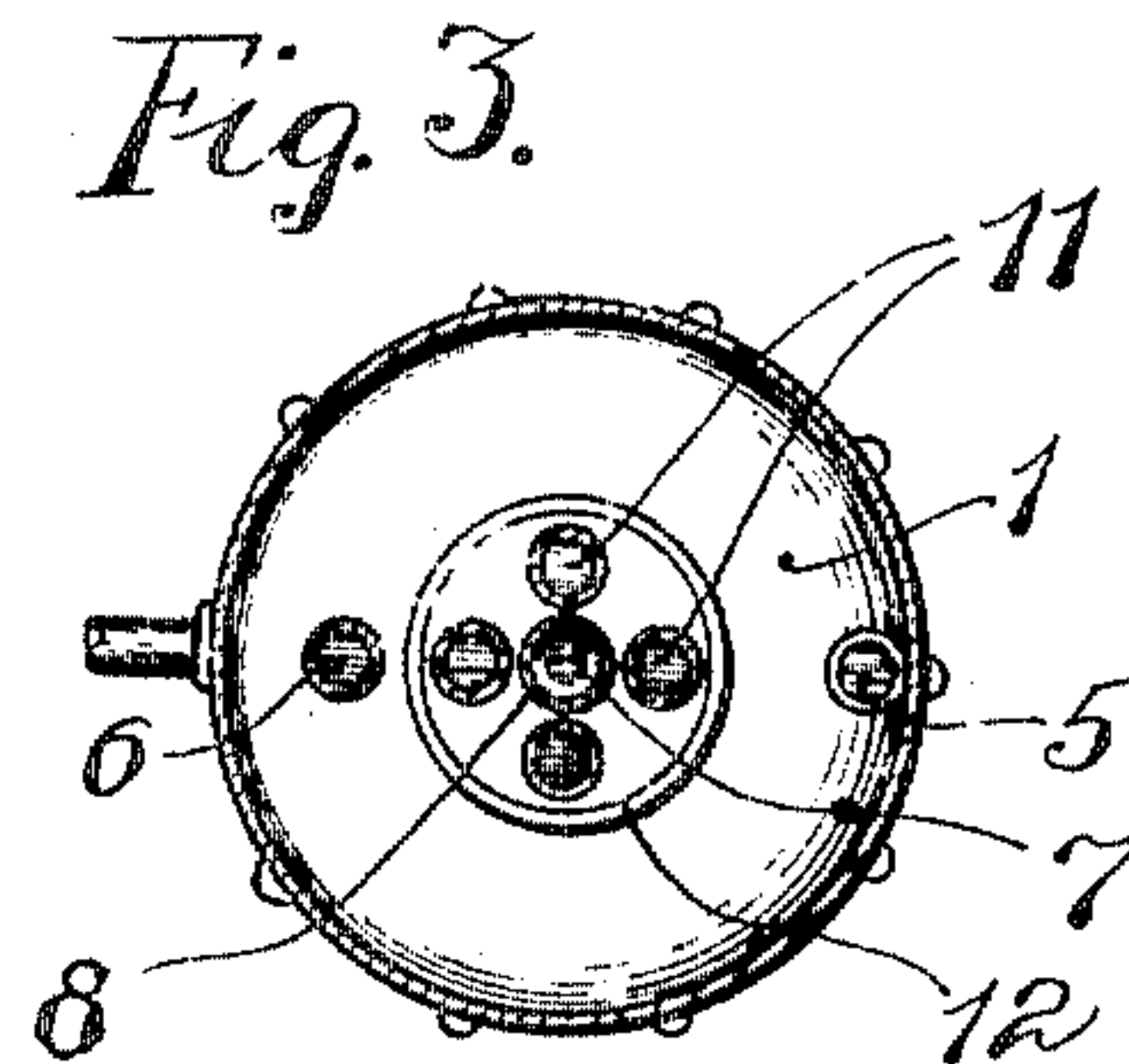
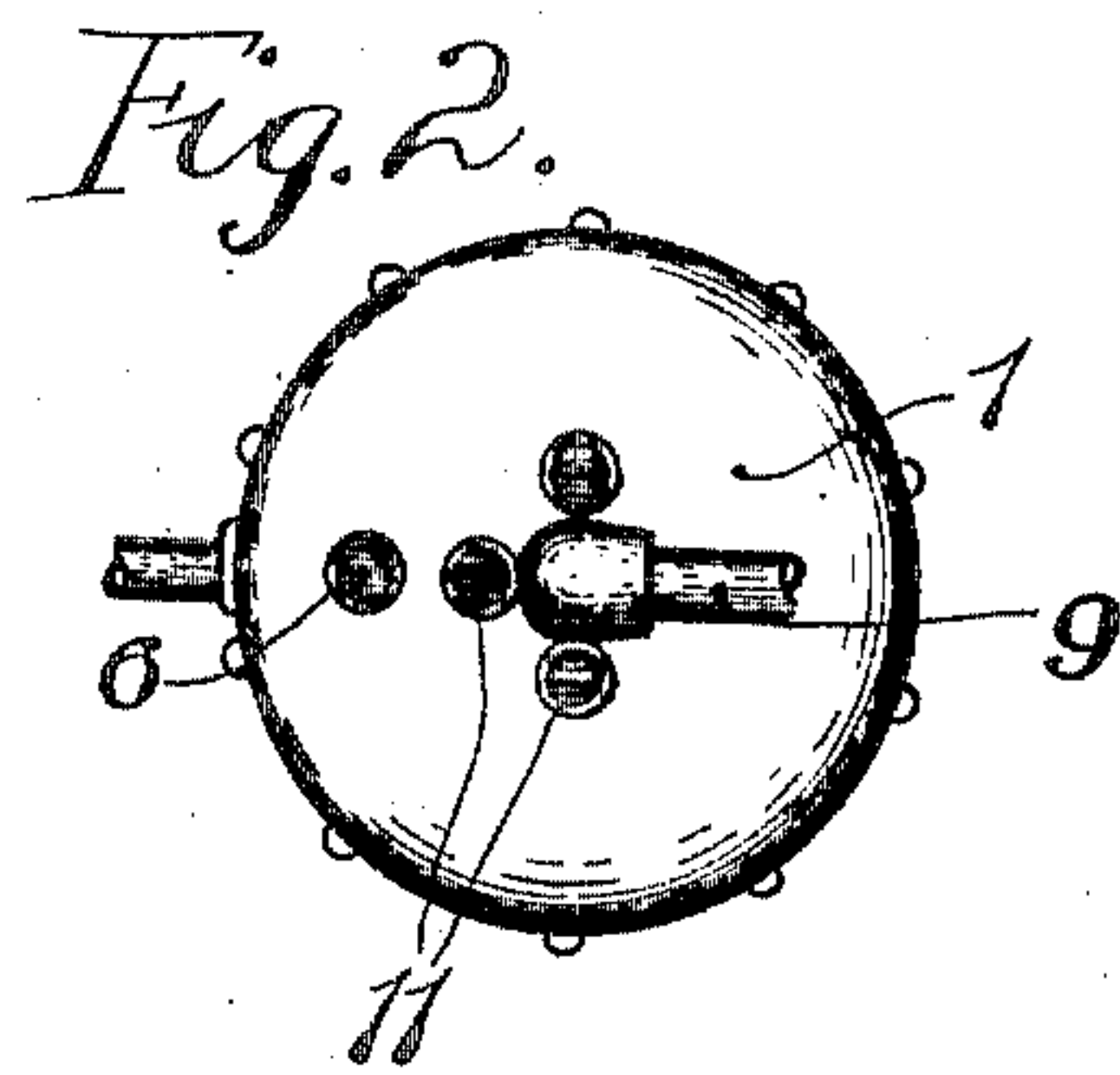
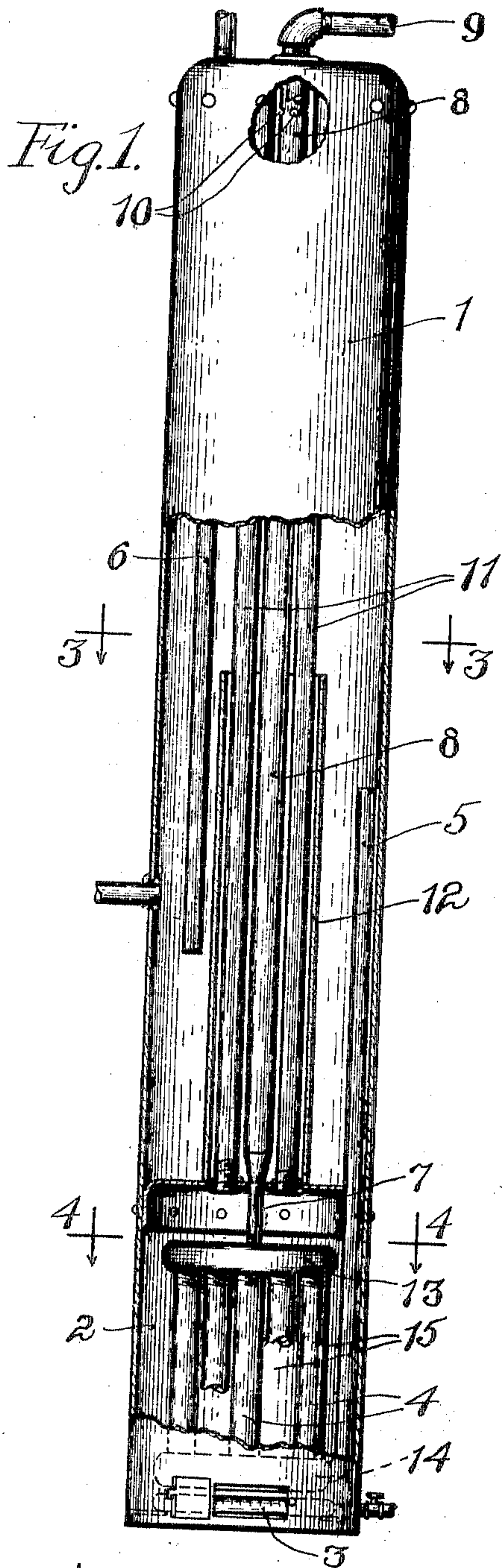


No. 817,219.

PATENTED APR. 10, 1906.

D. J. F. BUCK.  
GAS WATER HEATER.  
APPLICATION FILED FEB. 18, 1905.

2 SHEETS—SHEET 1.



Witnesses:

Arthur H. Boettcher,  
Charles J. Schmaier

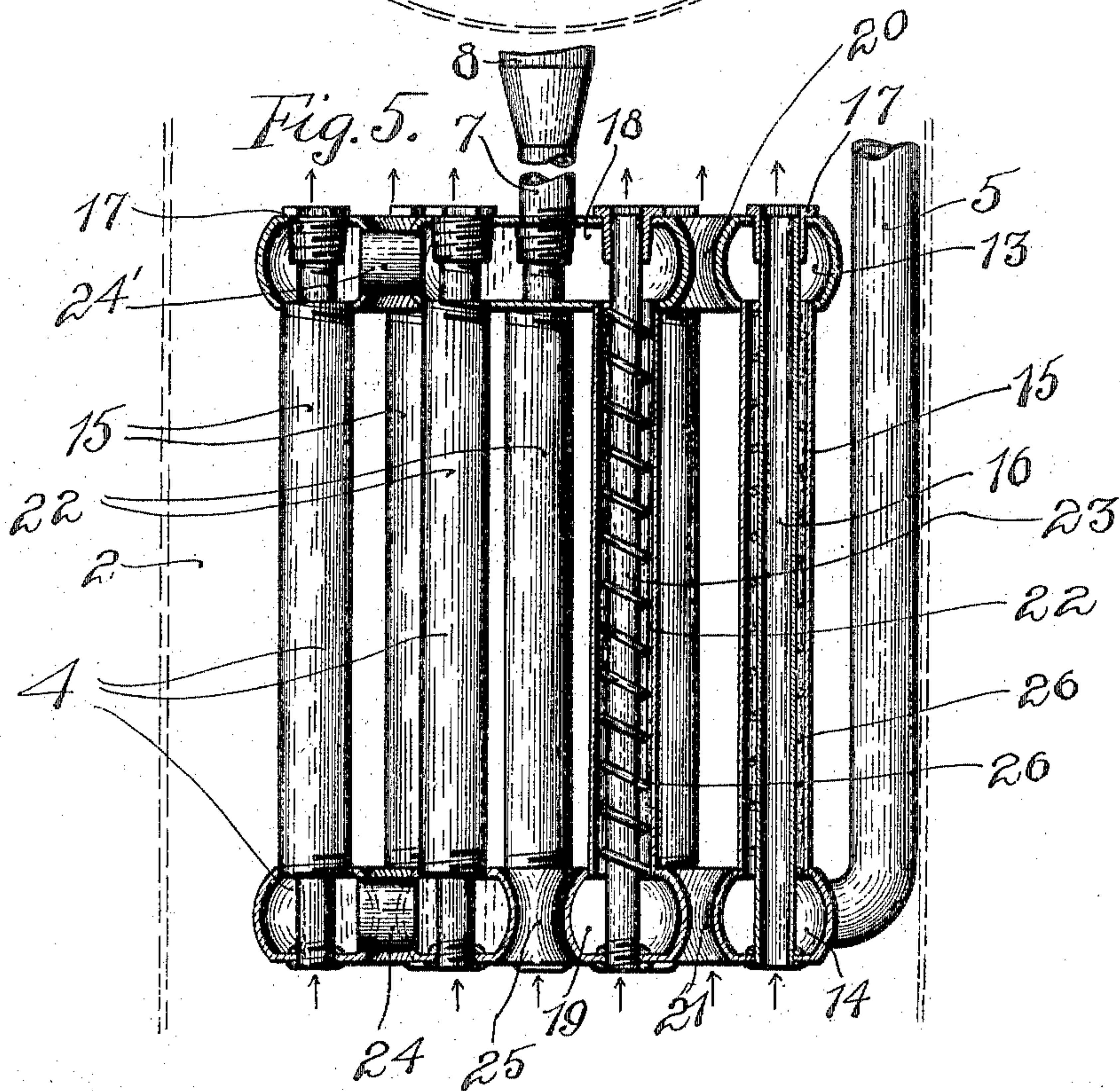
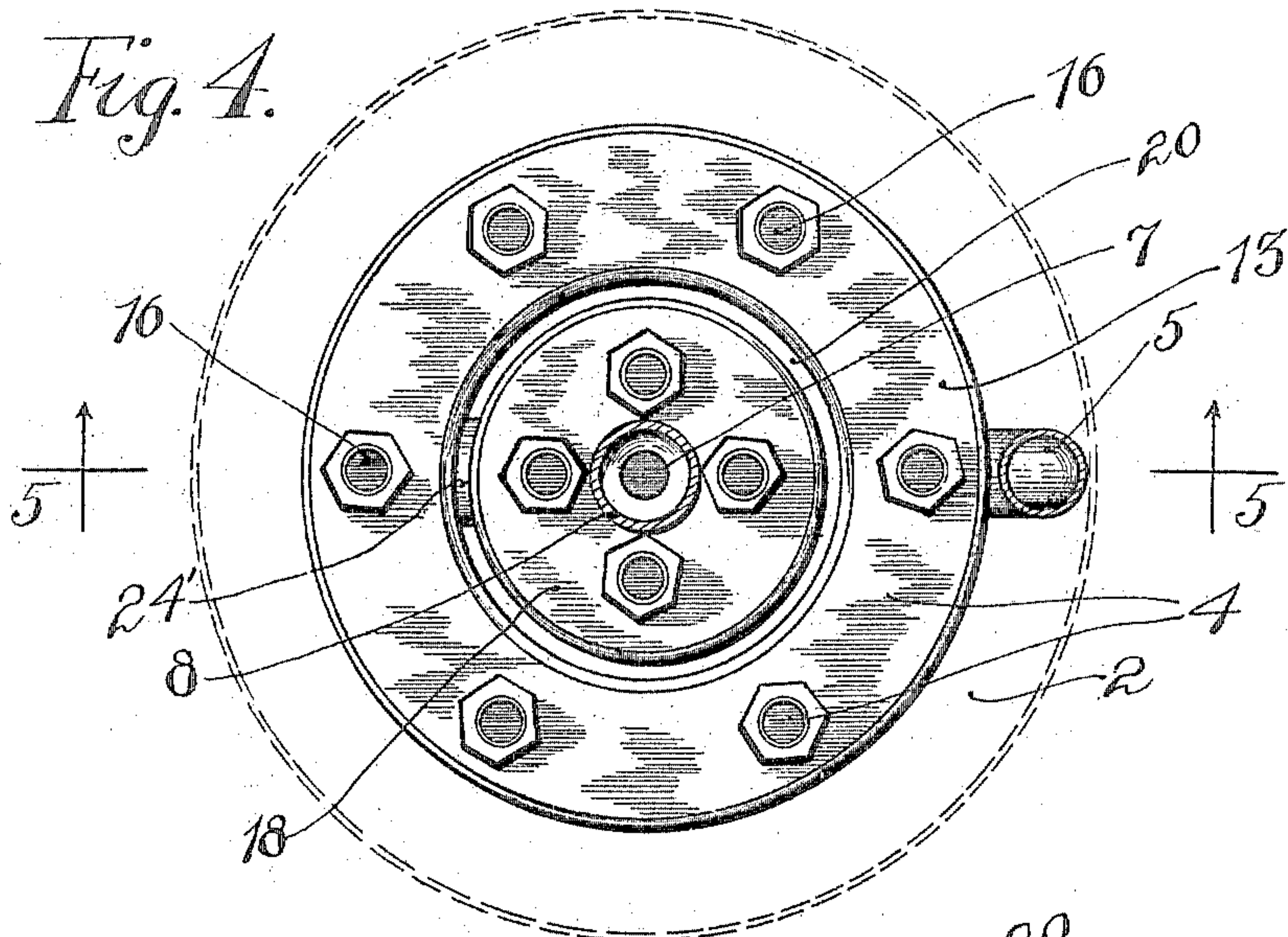
Inventor  
Daniel John F. Buck  
By Charles A. Brown  
Attorney

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APPLICATION FILED FEB. 18, 1905.

2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

DANIEL JOHN F. BUCK, OF CHICAGO, ILLINOIS.

## GAS WATER-HEATER.

No. 817,219.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed February 18, 1905. Serial No. 246,215.

*To all whom it may concern:*

Be it known that I, DANIEL JOHN F. BUCK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Gas Water - Heaters, (Case No. 2,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to heating appliances, particularly to gas water-heaters; and its object is to provide improved and more efficient arrangement and construction of the various heating and distributing mechanisms.

My invention may be best understood with reference to the accompanying drawings, in which—

Figure 1 is an elevation view of a vertical tubular boiler and heater, part of the shell being broken away to reveal interior arrangements. Fig. 2 is a top view of Fig. 1. Fig. 3 is a sectional view taken on line 3 3 of Fig. 1. Fig. 4 is an enlarged sectional view taken on line 4 4 of Fig. 1. Fig. 5 is a sectional view taken on line 5 5 of Fig. 4. Fig. 6 is a plan view of a bushing employed in assembling, and Fig. 7 is a sectional view taken on line 7 7 of Fig. 6.

The heater-frame consists of the upper boiler or storage section 1 and the fire combustion-chamber section 2 below the storage-section. A burner 3 for gas or other fuel is disposed at the lower part of the combustion-chamber, the heat from which passes upwardly through and around the piping of an improved primary heater 4, which will be described more in detail later. The water-inlet pipe 5 supplies water to the primary heater and conveys the water thereto directly from a main or from the interior of the storage-tank 1, in which case the cold water is delivered to the tank through the pipe 6, entering, as shown, through the top thereof. The water from the piping 5 circulates upwardly through the primary heater and absorbs the heat from the burner, the heated water passing through the outlet-pipe 7 and through the pipe 8 to the distributing-piping 9 and to the source of consumption. When no water is consumed from the distributing-piping 9, the heated water passes through the openings 10 10 at the upper end of the pipe-section 8 and is delivered at the upper part of the storage-tank, from where it is later drawn upon opening of outlets connected with the dis-

tributing-piping. It will be noticed that the pipe-section 8 is of greater diameter than the piping 7 leading thereto from the primary heater. The pipe 8 therefore acts as a reservoir or storage-compartment, particularly when the heated water is used immediately upon lighting of the burner. The pipe 7 being reduced impedes the flow of water thereto, and thus the water supplied to the primary heater is caused to linger more or less therein to be more thoroughly heated before arriving in the section 8. Furthermore, the pipe 8 acting as a reservoir prevents the sudden withdrawal of all the hot water through the distributing-pipe 9, which is also of less diameter than this storage-pipe. In heaters of this class heretofore the outlet-pipe from the primary heater was of the same diameter throughout, and the water-flow was not sufficiently impeded to allow rapid enough heating thereof to supply the primary demand. The primary heater 4, with this arrangement of outlet-piping, forms a very efficient quick heating appliance independent of the storage-tank and other apparatus.

The inlet-pipe 5 is preferably extended a distance upwardly in the tank. In the first place, this prevents sediment or dirt from entering the pipe 5 and assists in the quick heating of the water, as the water entering the pipe is taken from near the top and much warmer than if taken from the bottom of the tank. The inlet-pipe 6 also is extended below the top of the pipe 5 to prevent the cold water therefrom from immediately entering the pipe 5.

The residual heat and gases from the burner pass through flues 11, which extend from the combustion-chamber upwardly through the interior of the tank and opening through the top thereof. To prevent the cold water at the bottom of the tank from absorbing the heat of the hot water in the pipe 8, these flues are arranged to form a protective jacket or wall about the pipe 8, and to further shut out the cold water I provide a pipe or shell 12, which surrounds the lower part of the flues and the pipe 8. The heat passing through the flues is thus confined and directed toward the lower part of the pipe 8, and the quick heating of the water is thereby greatly facilitated. Any heat left in the flues after passage through the shell 12 is conveyed to the water at the upper part of the tank, and thus by this arrangement of piping, flues, and protective shell the available heat is all



confined and directed in such a manner as to produce the most rapid efficient heating of the water.

As best shown in Figs. 4 and 5, the primary heater consists of an outer frame and an inner frame. The outer frame consists of upper and lower annular flat heater-sections 13 and 14, connected by pipes or passage-ways 15, which are threaded into the lower and upper walls, respectively, of the upper and lower sections. Any number of such connecting-pipes or passage-ways may be employed. Through the interior of each passage-way and through the annular sections flues 16 are arranged, these flues being secured to the upper and lower walls, respectively, of the upper and lower annular sections, special bushings 17, such as shown in Figs. 6 and 7, being employed and provided with outer threads for engaging the wall of the upper section and with inner threads for engaging the threaded upper ends of the flues. The inner heater-frame consists of the upper and lower annular heater-sections 18 and 19, arranged concentric with the corresponding sections of the outer heater-frame to leave annular passage-ways 20 and 21. The lower and upper walls, respectively, of these sections 18 and 19 are connected by the pipes 22, through which pass the flues 23, connected to the sections in a similar manner as in the outer heater-frame sections. The inlet-pipe 5 connects with the lower outer annular section 14, and from a diametrically opposite point the connecting-pipe 24 connects with the lower inner annular section 19, thus causing the water to circulate entirely through the lower section before being admitted to the inner heater-frame. The water from the lower sections passes upwardly through the pipes 15 and 22 and circulates through the upper annular sections and between the sections through a connection 24' and from the center of the inner upper section passes upwardly through the piping 7 and 8 to the distributing-piping or to the upper part of the storage-tank. The heat from the burner 3 passes upwardly through the flues 16 and 23, through the annular passage-ways 21 and 20, and through the inner passage-way 25 of the lower inner section, some of the heat also passing around the outer edge of the lower section. Thus the heat is caused to circulate and to be directed against the entire exterior of all the pipes and through the flues to the water passing through the pipes, and a very rapid heating is assured. To retard the flow of water through the pipes 15 and 22, retarding means, such as spiraled wires 26, may be arranged about each flue. These wires cause agitation and spiral circulation of the water through the pipe, the water being thus more readily adapted to absorb a great amount of heat in a very short time. The residual heat from the primary heater passes upwardly

through the flues 11 and is confined, as before described, to superheat the water in pipe 8 and at the upper part of the boiler.

A hot-water heating arrangement of this construction is very inexpensive, as it may substantially be built up of ordinary gas-piping, the only special parts being the annular heater-sections, the arrangement of the parts and the retarding and deflecting means employed causing a more efficient and rapid heating of the water than any heating devices heretofore employed.

I claim as new and desire to secure by Letters Patent—

1. In a water-heating device, the combination with a storage-tank, of a combustion-chamber disposed below said tank, a primary heater in said combustion-chamber, a pipe passing through the interior of said tank for leading the heated water from the primary heater to the upper part of the storage-tank and to the distributing system, said pipe being surrounded by the water in the tank, and means for maintaining a layer of water adjacent to said pipe at a higher temperature than the surrounding water.

2. In a water-heating device, the combination with a storage-tank, of a combustion-chamber disposed below said tank a primary heater in said combustion-chamber, a pipe passing through the interior of said tank for leading the heated water from the primary heater to the upper part of the storage-tank and to the distributing system, said pipe being surrounded by the water in the tank, and means for causing the residual heat from the combustion-chamber to heat a layer of water adjacent to said pipe to a higher temperature than the surrounding water.

3. In a water-heating device, the combination with a storage-tank, of a combustion-chamber disposed below said tank, a primary heater in said combustion-chamber, a pipe passing through the interior of said tank for leading the heated water from the primary heater to the upper part of the storage-tank and to the distributing system said pipe being surrounded by water, and flues passing through the interior of the tank and connecting said combustion-chamber with the atmosphere at the upper end of the tank, said flues being arranged closely about said pipe to form a protecting-jacket therefor and to further heat the water about said pipe and therein.

4. In a water-heating device, the combination with a tubular vertical tank or boiler, of a combustion-chamber below the tank, a primary heater in said combustion-chamber, a pipe passing through the center of the tank for leading the heated water from the primary heater to the upper part of the tank and to the distributing system, said pipe being surrounded by the water in the tank, a plurality of flues connecting the combustion-



chamber with the atmosphere at the upper end of the tank, said flues being arranged around and adjacent to said pipe to form a heating-jacket therefor, and a shell surrounding the lower parts of said flues and said pipe for confining about said pipe the water heated by said flues.

5. In a device for heating water, the combination with a tubular vertical storage tank or boiler, of a combustion-chamber below said boiler, a primary heater within said combustion-chamber, a pipe passing through the interior of the boiler for leading the heated water in said primary heater to the upper part of the boiler and to the distributing system, the part of said pipe passing through the boiler being of increased diameter to form a primary storage-compartment for the water heated in the heater, said pipe being surrounded by water, and a plurality of flues passing through the interior of the boiler and connecting the combustion-chamber with the atmosphere, said flues being arranged adjacent to said pipe to form a heating-jacket therefor to heat the water adjacent to said pipe.

6. In a device for heating water, the combination with a tubular vertical storage tank or boiler, of a combustion-chamber below said boiler, a primary heater within said combustion-chamber, a pipe passing through the interior of the boiler for leading the heated water in said primary heater to the upper part of the boiler and to the distributing system, the part of said pipe passing through the boiler being of increased diameter to form a primary storage-compartment for the water heated in the heater, a plurality of flues passing through the interior of the boiler and connecting the combustion-chamber with the atmosphere, said flues being arranged adjacent to said pipe to form a heating-jacket therefor, and a shell or pipe closely surrounding said flues, whereby the heat passing through the flues is confined and directed toward the pipe of increased diameter.

7. In a device for heating water, the combination with an outer and an inner heating-frame, each frame having an upper and a lower annular heater-section connected by pipes, a connection between said frames, and a flue passing through the interior of each of said pipes and through said annular sections.

8. In a device for heating water, the combination with an outer and an inner heating-frame, each frame having an upper and a lower annular heater-section connected by pipes, a connection between said frames, a flue passing through the interior of each of said pipes and through said annular sections, and means for retarding the water-flow through said pipes.

9. In a device for heating water, the combination with an outer and an inner heating-frame, each frame having an upper and a

lower annular heater-section connected by pipes, a connection between said frames, a flue passing through the interior of each of said pipes and through said annular sections, and wires spiraled about said flues for retarding the flow of water through said pipes.

10. In a device for heating water, the combination with outer and inner cylindrical heater-frames arranged concentric, each frame comprising an upper and a lower flat annular section or chamber, pipes connecting the annular sections of each frame, connections between the corresponding sections of the frames, a water-inlet for said frames, an outlet for the water from said frames, flues extending through the interior of said pipes and sections, and a burner below said frames, the heat from said burner passing upwardly through said flues and around the exterior of said pipes for heating the water therein.

11. In a device for heating water, the combination with outer and inner cylindrical heater-frames arranged concentric, each frame comprising an upper and a lower flat annular section or chamber, pipes connecting the annular sections of each frame, connections between the corresponding sections of the frames, a water-inlet for said frames, an outlet for the water from said frames, flues extending through the interior of said pipes and sections, a burner below said frames, the heat from said burner passing upwardly through said flues and around the exterior of said pipes for heating the water therein, and obstructions for retarding the flow of water through said pipes.

12. In a device for heating water, the combination with a storage-tank, of a combustion-chamber below said tank, a burner at the bottom of said combustion-chamber, a heater-frame over said burner, an upper and a lower flat annular heater section or chamber for said frame, pipes connecting said annular sections, a water-inlet to the lower section, an outlet of reduced cross-section from the upper annular section, a pipe of enlarged diameter leading through the boiler with the lower end of which said outlet of reduced cross-section connects, and flues passing through the interior of the pipes of the heater-frame and through the annular sections, the heat from the burner passing through said flues and about said pipes, and the heated water from the heater-frame passing upwardly through the reduced outlet and into the enlarged pipe to be conveyed to the upper part of the storage-tank and to the distributing system.

13. In a device for heating water, the combination with a tubular storage-tank, of a combustion-chamber arranged below said tank, a burner at the bottom of the combustion-chamber, a primary heater arranged above the burner, said primary heater being composed of a plurality of cylindrical heater-



frames assembled concentrically, an upper and a lower flat annular section or chamber for each heater-frame, pipes connecting the upper and lower annular sections of each frame, a water-inlet for supplying water to the lower sections of the frames, an outlet-pipe for leading the heated water from the upper sections and through the interior of the boiler to convey the heated water to the top thereof and to the distributing system, and flues passing through the interior of the pipes of the primary heater, the heat from said burner passing through said flues and about said pipes and sections.

14. In a device for heating water, the combination with a tubular storage-tank, of a combustion - chamber arranged below said tank, a burner at the bottom of the combustion - chamber, a primary heater arranged above the burner, said primary heater being composed of a plurality of cylindrical heater-frames assembled concentrically, an upper and a lower flat annular section or chamber for each heater-frame, pipes connecting the upper and lower annular sections of each frame, a water-inlet for supplying water to the lower sections of the frames, an outlet-pipe for leading the heated water from the upper sections and through the interior of the boiler to convey the heated water to the top thereof and to the distributing system, flues passing through the interior of the pipes of the primary heater, the heat from said burner passing through said flues and about said pipes and sections, and main flues passing through the interior of the boiler for leading the products of combustion from the combustion-chamber to the atmosphere at the top of the boiler, said main flues closely surrounding the outlet-pipe through said boiler to form a heating-jacket therefor.

15. In a device for heating water, the combination with a tubular storage-tank, of a combustion - chamber arranged below said tank, a burner at the bottom of the combustion - chamber, a primary heater arranged

above the burner, said primary heater being composed of a plurality of cylindrical heater-frames assembled concentrically, an upper and a lower flat annular section or chamber for each heater-frame, pipes connecting the upper and lower annular sections of each frame, a water-inlet for supplying water to the lower sections of the frames, an outlet-pipe for leading the heated water from the upper sections and through the interior of the boiler to convey the heated water to the top thereof and to the distributing system, flues passing through the interior of the pipes of the primary heater, the heat from said burner passing through said flues and about said pipes and sections, main flues passing through the interior of the boiler for leading the products of combustion from the combustion-chamber to the atmosphere at the top of the boiler, said main flues closely surrounding the outlet - pipe through said boiler to form a heating-jacket therefor, and a shell closely surrounding the lower half of said flues for confining and directing the heat therefrom toward the outlet-pipe.

16. In a device for heating water, the combination with an upper and a lower annular heater-section, of a plurality of pipes connecting said sections and having engagement with the inner walls of said sections, flues extending through said pipes having threaded engagement at one end with the outer wall of one section and secured at their other ends to the outer wall of the other section by thimbles, said thimbles having threaded engagement with the outside of the flues and threaded engagement with openings in the outer wall, and a burner for directing heat through said flues and about said pipes.

In witness whereof I hereunto subscribe my name this 16th day of February, A. D. 1905.

DANIEL JOHN F. BUCK.

Witnesses:

CHARLES J. SCHMIDT,  
HARVEY L. HANSON.