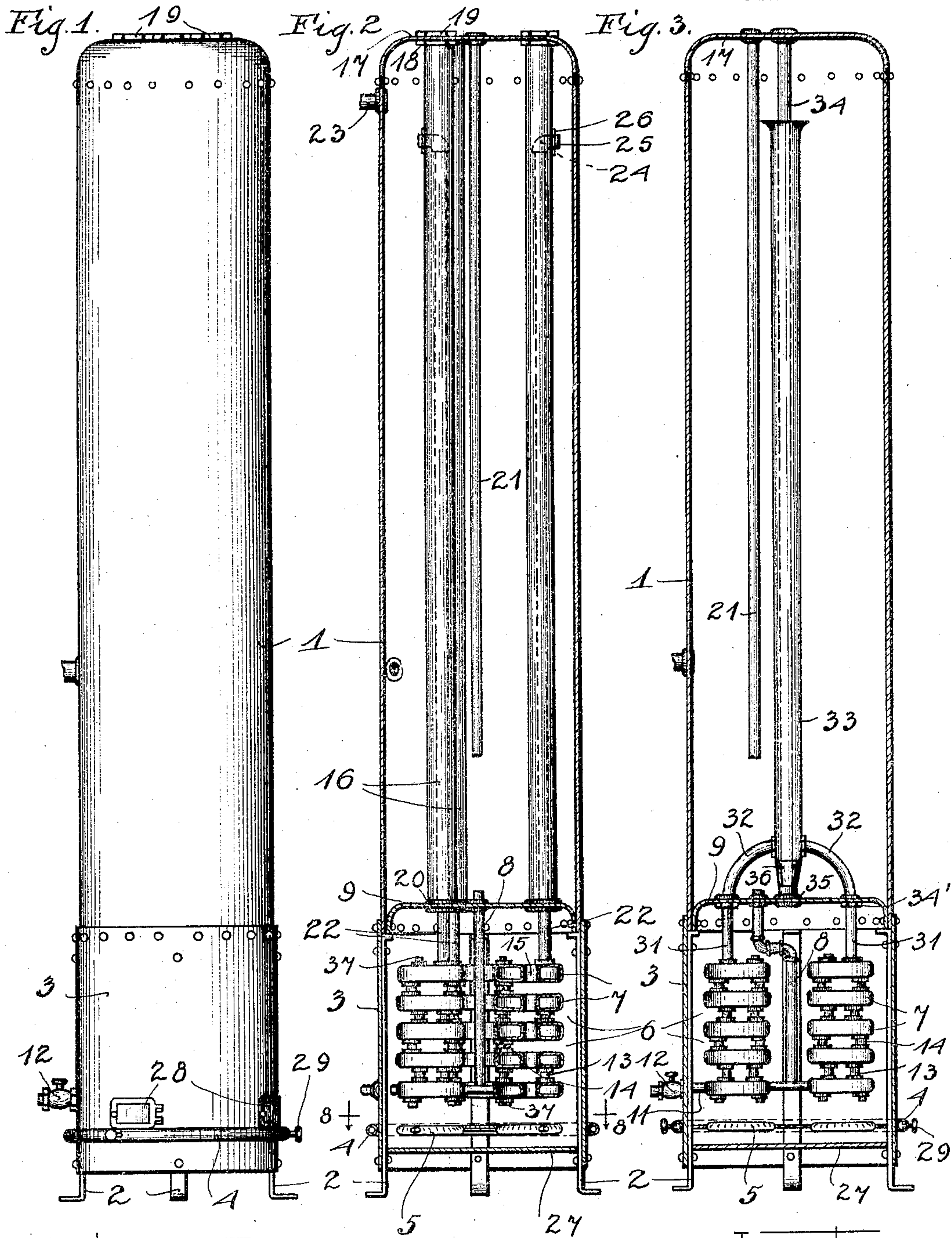


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PATENTED FEB. 21, 1905.

D. J. F. BUCK.  
GAS WATER HEATER.  
APPLICATION FILED AUG. 20, 1904.

2 SHEETS—SHEET 1.



Witnesses:

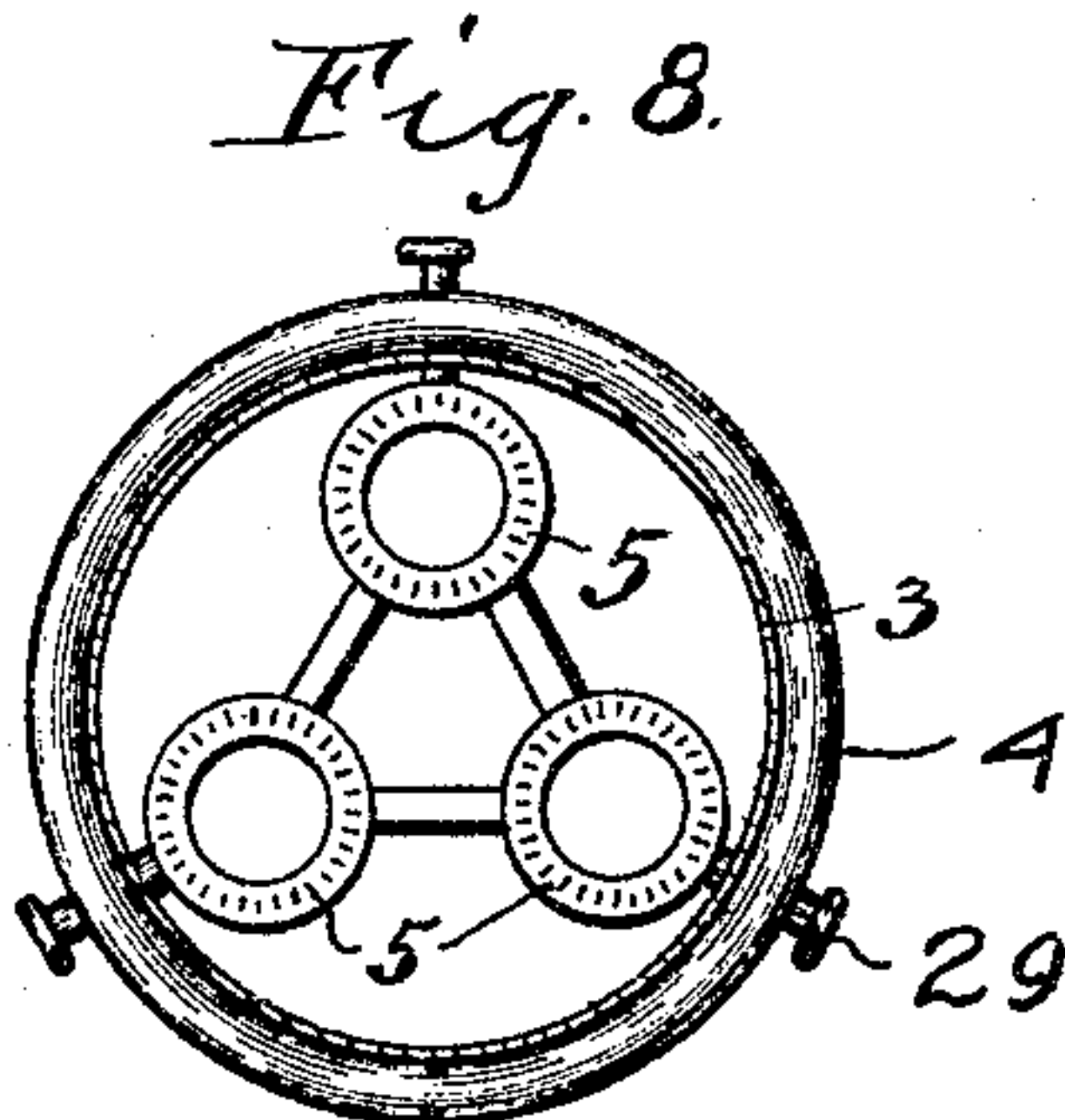
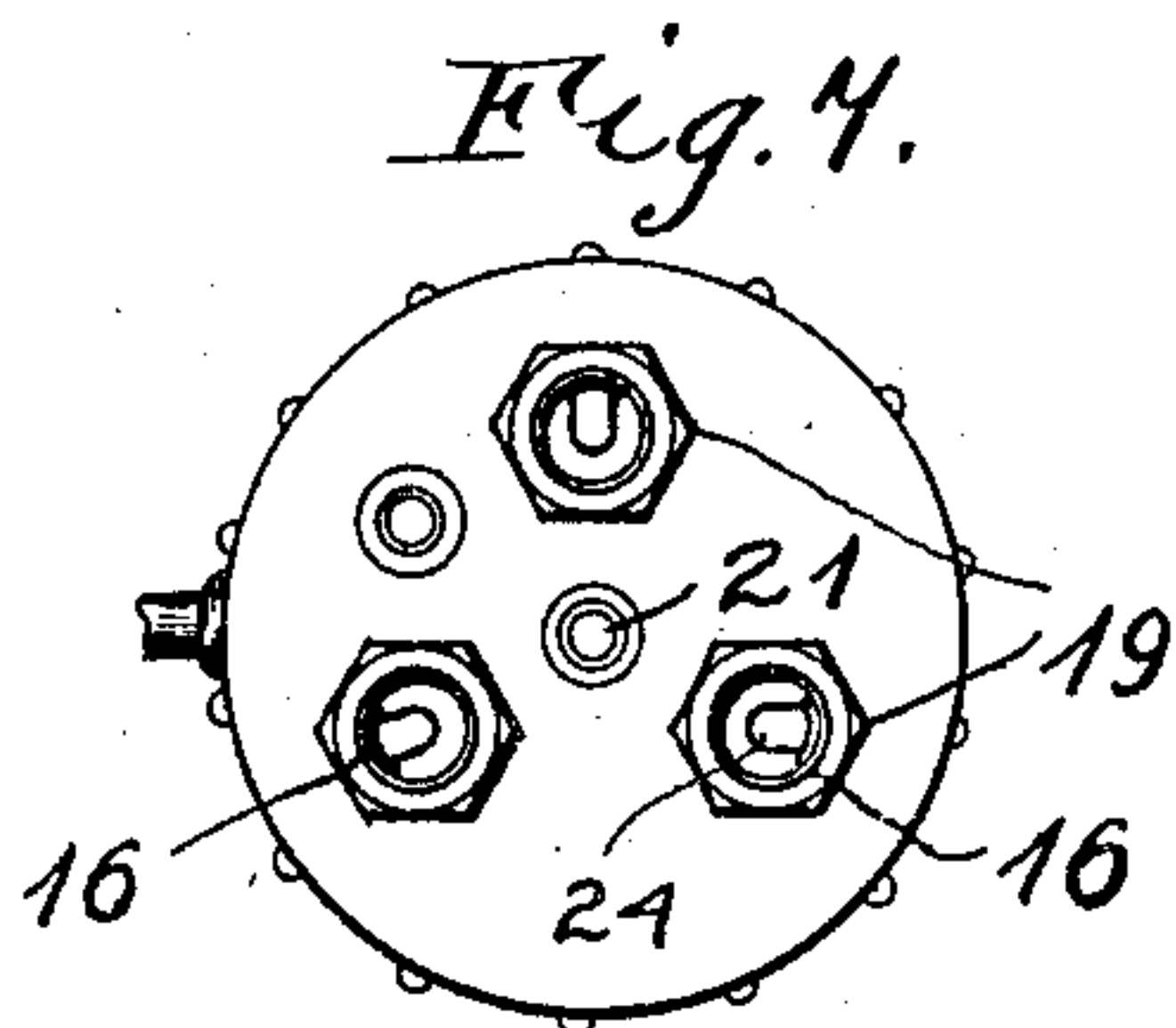
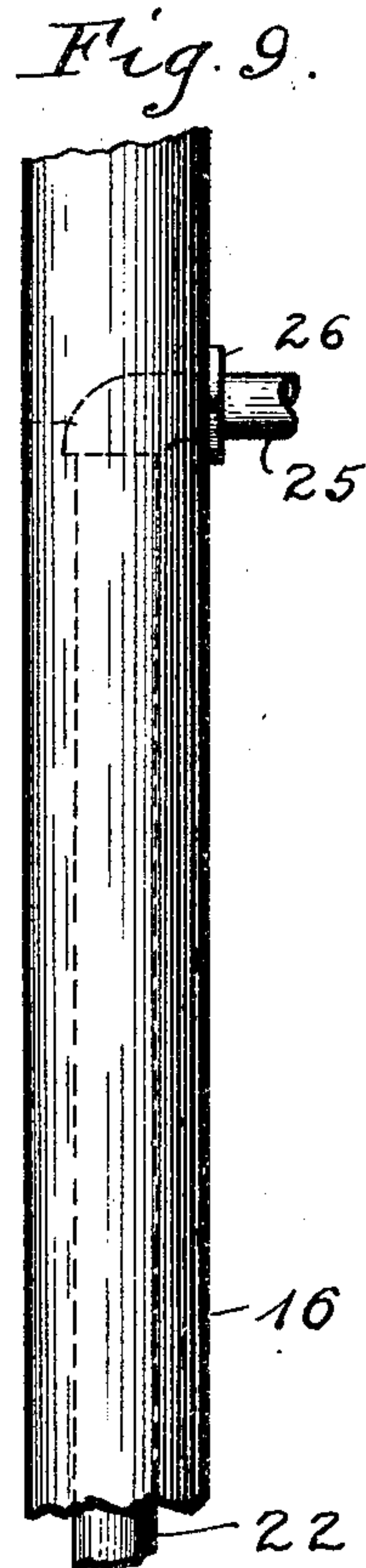
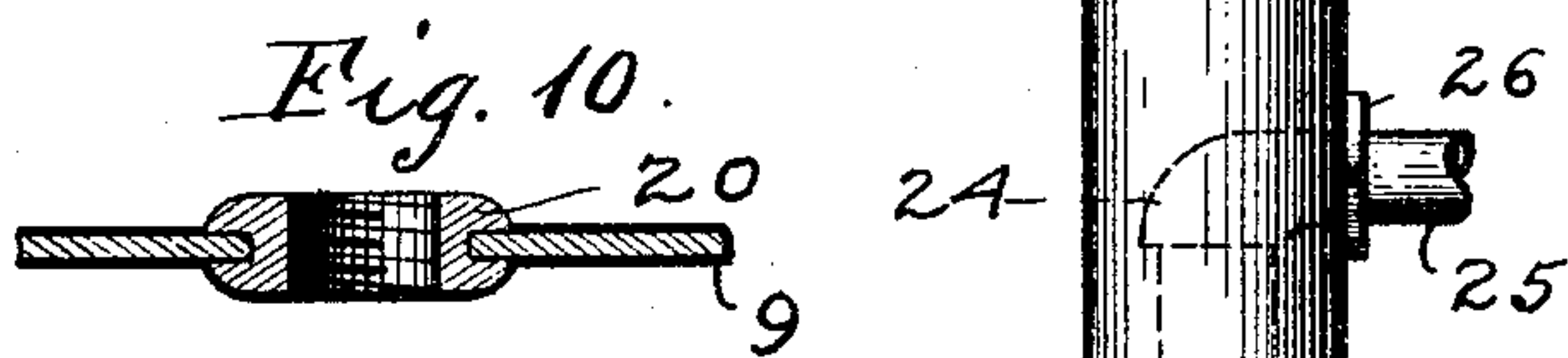
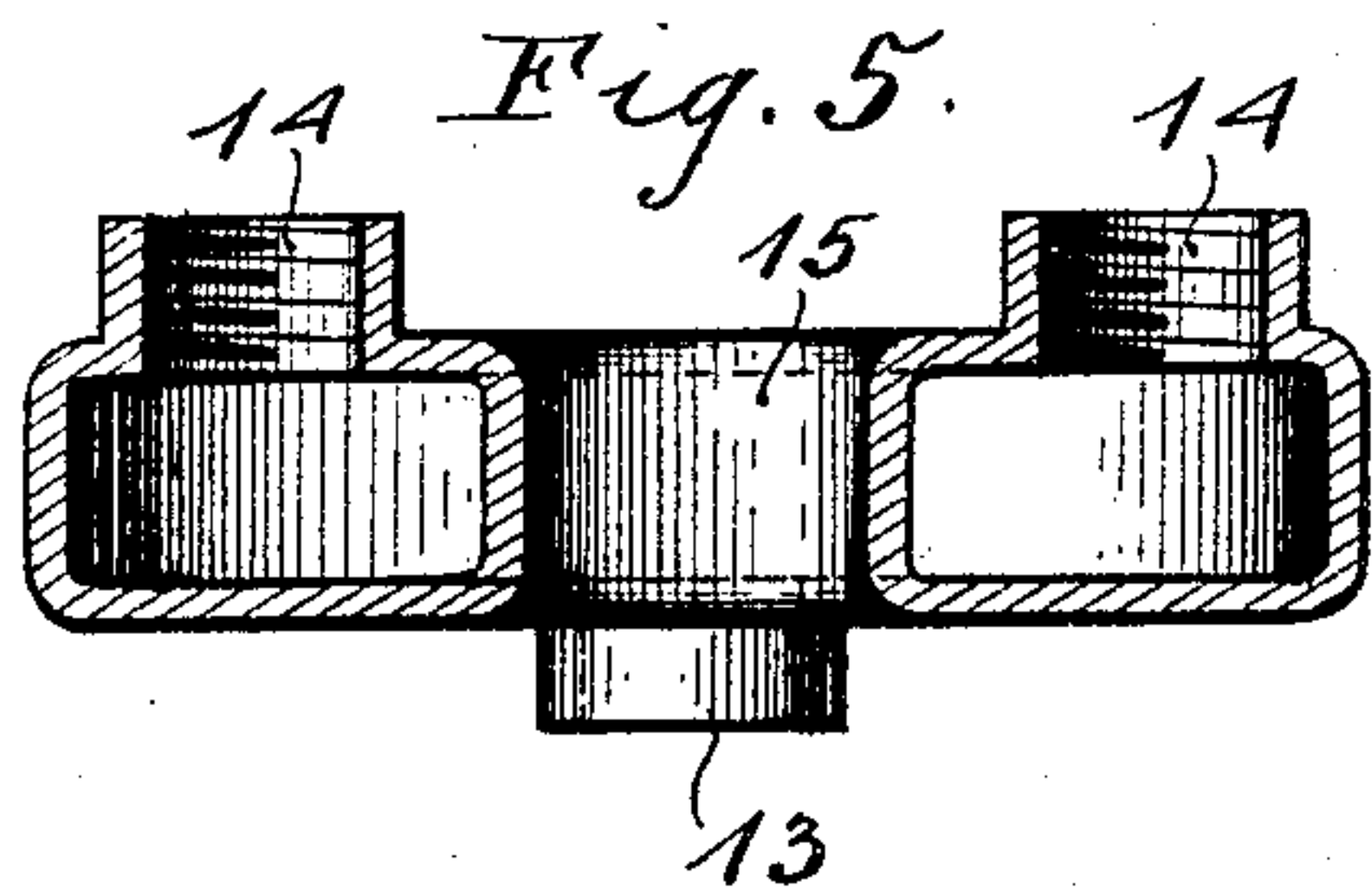
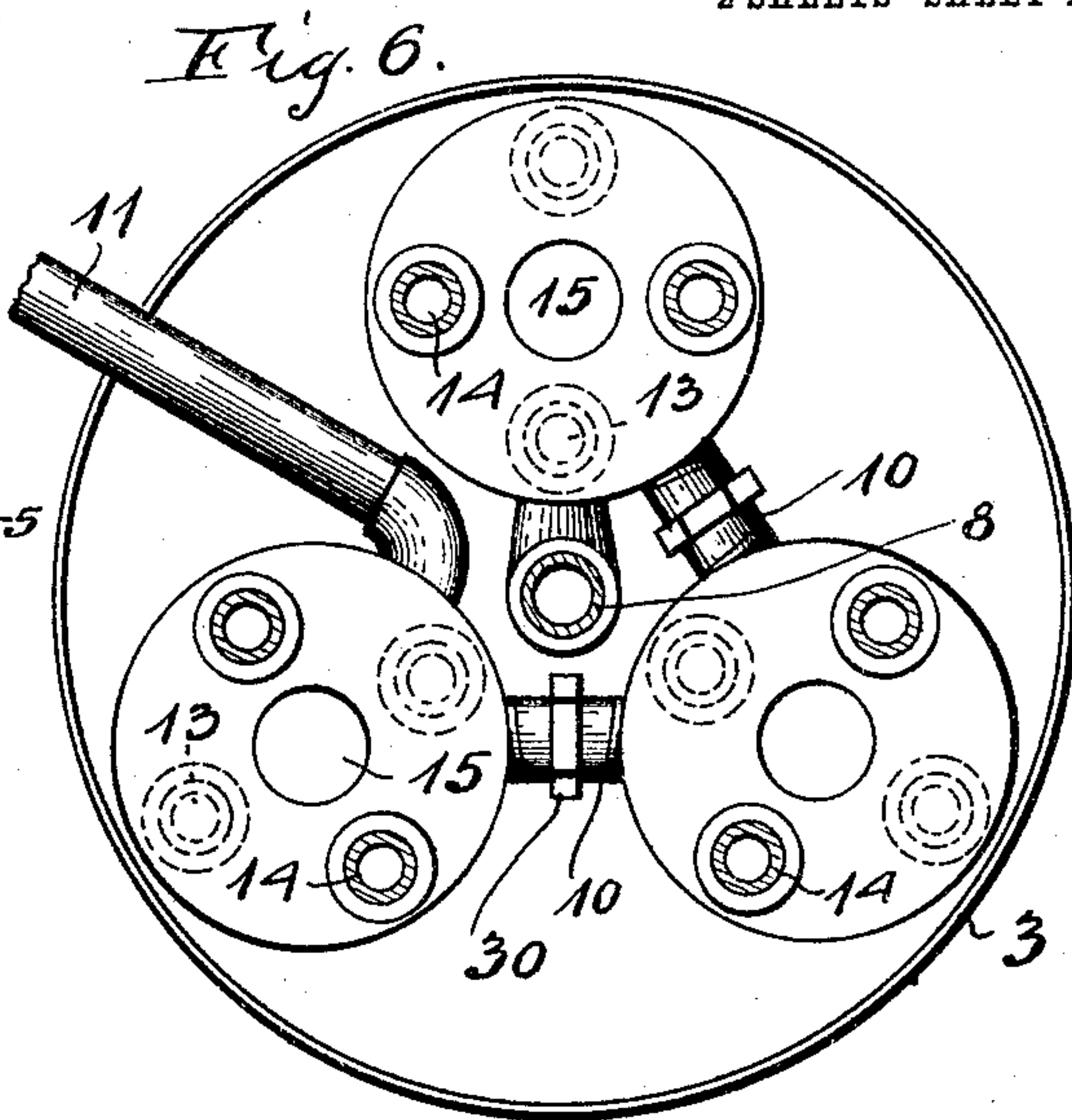
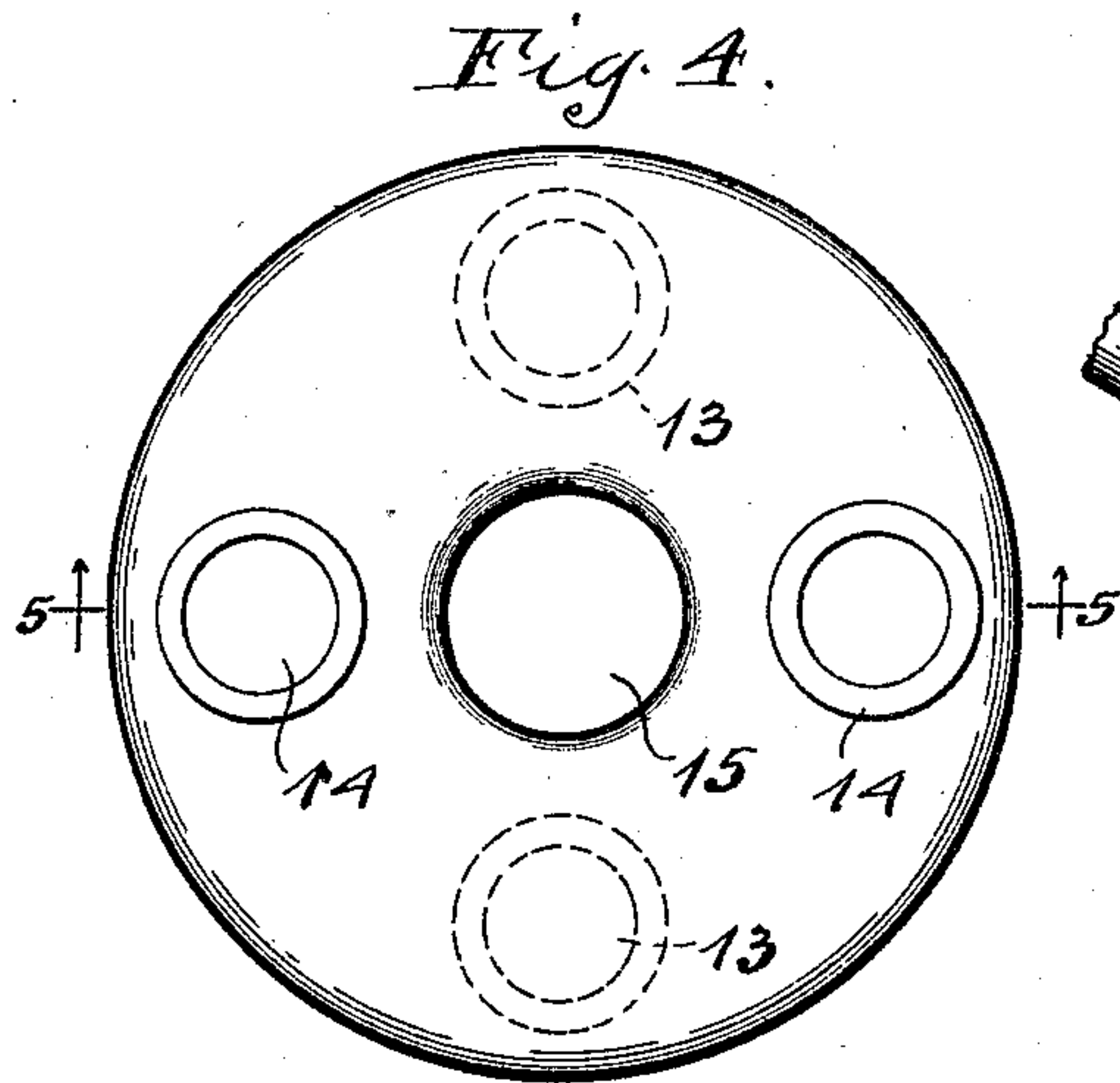
Arthur H. Boettcher,  
Charles J. Schmidt.



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GAS WATER HEATER.  
APPLICATION FILED AUG. 20, 1904.

2 SHEETS—SHEET 2.



WITNESSES:  
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Attorney



## UNITED STATES PATENT OFFICE.

DANIEL JOHN F. BUCK, OF CHICAGO, ILLINOIS.

## GAS WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 783,243, dated February 21, 1905.

Application filed August 20, 1904. Serial No. 221,470.

*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. 1,) 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 water-heaters, and its object is to provide more efficient and more inexpensive means for heating water in a tank or boiler, particularly where the heated water is being drawn while heating is in operation.

My invention is of particular adaptation for heating water in the ordinary kitchen-boilers or in boilers connected with bath-tubs and may be applied to such boilers without greatly modifying their construction.

As a fuel I prefer to use gas, and I provide a heating chamber or oven below the boiler part and dispose one or more gas-burners near the bottom thereof. Above each burner is disposed a tier of annular water-heating chambers, the lower chambers being connected with the cold-water supply and the upper chambers of the tier being connected with pipes which deliver the hot water to the top of the boiler, from whence it may be drawn and utilized. The pipes which carry the hot-water pass through flues which pass longitudinally through the interior of the boiler and the residual heat from the water-heating chambers passes through these flues and serves to heat the water surrounding the flues and also to still further heat the hot water in the pipes disposed within the flues, the pipes being of less external diameter than the internal diameter of the flues. Any number of burners and a corresponding number of tiers of water-sections may be employed, and thus the water heated in any desired time, or the water may be kept at a desired temperature while continually flowing from the boiler.

My invention will be better understood by reference to the accompanying drawings, in which—

Figure 1 is an elevation view of the boiler with my invention applied thereto. Fig. 2 is

an elevation view, the casing and one tier of water-sections being shown in section. Fig. 3 shows an elevation view of a modified form of heater, the shell being shown in section. Fig. 4 is plan view of a heater-section. Fig. 5 is a sectional view of the heater-section, taken on line 5 5, Fig. 4. Fig. 6 shows the manner of connecting together the lower sections of the tiers. Fig. 7 shows a top view of Fig. 1. Fig. 8 is a sectional view taken on line 8 8 of Fig. 2. Fig. 9 shows a connection between a flue-pipe and a water-pipe, and Fig. 10 shows the manner of securing a threaded sleeve to the sheet material of the boiler for receiving threaded ends of pipes.

Like characters of reference refer to like parts throughout the various figures.

An ordinary boiler 1, such as is used in the kitchen for connection with a stove or range, is mounted upon suitable standards 2 2, surrounded by an inclosing shell 3 of sheet material. A fuel-supply pipe 4 may surround the shell 3 near lower end thereof, with which pipe any number of burners 5 may be connected, which burners may be ordinary gas-burners. Above each burner is disposed a tier 6 of water-heater sections 7 7, connected serially together, the lower sections of the tiers being connected with a pipe 8, passing through the base 9 of the boiler and extending a slight distance within the boiler. As shown in Fig. 6, the pipe 8 may be connected directly with one lower section and all the lower sections connected serially together by means of connecting-nipples 10 10, and for cleaning purposes a pipe 11 may lead from the last lower section in the series to the outside of the shell 3 and there be provided with a normally closed valve 12. Each heater-section is annular in shape, as shown in Figs. 4 and 5, and provided with inlet-openings 13 13 and outlet-openings 14 14, the central openings 15 in each tier being preferably alined. To cause thorough agitation of the water within each heater-section and to insure rapid heating thereof, I angularly displace the inlet from the outlet openings, the inlet-openings being shown as disposed diametrically at opposite sides of the central opening and displaced one hundred and eighty degrees from



the outlet-openings, which are also disposed diametrically and opposite the central openings. The water to pass from an inlet to an outlet opening must thus circulate ninety degrees through the section, and a thorough mixture of the warm with the colder part is insured and a rapid heating of the entire water accomplished. Each tier is disposed directly above a burner and the heat from the burners circulates about the sections and passes through the central openings, the residual heat and products of combustion passing upwardly through flue-pipes 16 16, which extend longitudinally through the interior of the boiler and which are secured at their ends in the upper wall 17 and the lower wall 9 of the boiler. The upper end of each flue is threaded and lock-nuts 18 and 19 engage the threaded ends, respectively, on the inside and outside of the boiler and clamp between them the boiler-head 17. The lower ends of the flues are threaded to sleeves 20, which are preferably riveted to the lower wall 9, as shown in Fig. 10. Cold water is supplied through the pipe 21, which may extend through the head of the boiler and downwardly to within a short distance of the bottom of the boiler. The cold water after reaching the level of the pipe 8 flows therethrough and into the lower sections of the tiers and distributes itself and passes upwardly through the successive sections of each tier. The top section of each tier is connected with a pipe 22, which is of less diameter than the flue-pipes. Each boiler-pipe extends through one of the flue-pipes and emerges through the wall of the flue-pipe and communicates with the upper part of the boiler. As the cold water thus passes from the boiler to the lower sections it is gradually and quickly heated on its passage through the successive sections of the tiers and the hot water then passes upwardly through the pipes 22 and is delivered into the upper part of the boiler, from whence it may be drawn through an outlet 23. The residual heat and the products of combustion pass upwardly through the flues and heat is extracted by the water within the boiler surrounding the flues, and the water in the water-pipes is also further heated by the ascending hot gases, which leave the flues well spent of their heat. The pipes 22 at their upper ends may terminate in elbows 24, which engage nipples 25, the nipples extending through openings in the walls of the flues and engaged by lock-nuts 26 at the outside of the flues, the pipes 22 being thus firmly held in position. The pipe 8 extends into the boiler a slight distance for the purpose of preventing sediment from entering the heater-sections. An asbestos wall 27 may also be provided below the burners for preventing the deflection and escape of heat. Doors 28 28 may also be provided in the shell 3 and suitably disposed to allow access to the burners, which are primarily controlled by supply-valves 29 29,

disposed at the outside. Left and right hand nipples, as shown in Fig. 6, furnish convenient and simple means for connecting together the inlet and outlet openings of the successive heater-sections, and each nipple may be provided with a flange 30, adapted for engagement by a flat wrench.

As before stated, any number of burners may be used or any number of tiers of heater-sections or any number of sections in a tier may be employed, depending upon conditions and upon the degree of heat to be furnished and upon the rapidity with which the water is to be heated. It is also unnecessary to use a flue and a water-pipe for each tier, and a common water-pipe might lead the hot water from the tiers and pass through a single flue or the several water-pipes from the tiers may all pass through a single flue. One modified arrangement of this kind is shown in Fig. 3, in which two burners are employed and two tiers of heater-sections, a pipe 31 leading from the top of each tier and passing through the lower wall 9 of the boiler into an elbow 32, which leads into a common water-pipe 33, which discharges near the top of the boiler. A common flue 34 leads through the top of the boiler and through the water-pipe 33, communicating at its lower end with the heating-chamber, receiving and conveying therefrom the gases, which further serve to heat the water in the water-pipe 33 on their upward passage. The cold water enters through the pipe 21 and is led to the heater-sections through the pipe 8. The connections between the elbows 32 and the pipes 31 are made water-tight by means of lock-nuts 34, which engage the pipes, and the lower walls 9 clamp between these lock-nuts and the flanges of the elbows 32. The water-pipe 33 may be threaded into the sleeve 35 and the flue-pipe 34 threaded into the reduced end 36 of the pipe 33, thus forming an air-tight joint and at the same time forming rigid connection between the pipes. Any number of tiers may be employed, each connecting through an elbow with the common pipe 33. The heater-sections may all be symmetrical, and one of the openings in the upper and lower sections of the tiers may be provided with a plug 37.

Many other modifications besides those referred to may be made without departing from the spirit of the invention, and I do not, therefore, wish to limit myself to the constructions and modifications outlined.

I desire to secure by Letters Patent—

1. In a water-heater, the combination with a tubular vertical boiler, of a combustion-chamber below said boiler, a plurality of gas-burners arranged in one horizontal plane at the bottom of said combustion-chamber, a tier of annular heater-sections arranged vertically above each burner, the sections of each tier being connected serially together, a pipe leading from the bottom of the boiler and con-



5 nected with the lower sections of each tier only to deliver the cold water thereto, the water in the lower sections upon being heated by the burners rising to the top section of the tier, an independent pipe leading from the top section of each tier and passing upwardly through the boiler to discharge hot water near the top thereof, and a flue surrounding each pipe, said flues passing from the combustion-chamber entirely through said boiler and connected with the atmosphere at the top of the boiler.

15 2. In a water-heater, the combination with a vertical tubular boiler, of a combustion-chamber upon which said boiler is mounted, a plurality of gas-burners arranged in the same horizontal plane at the bottom of the combustion-chamber, a tier of flat annular water-sections arranged vertically above each burner, inlet and outlet openings for each section, said inlet and outlet openings being each disposed on diametrical lines angularly displaced one hundred and eighty degrees from each other whereby the water flowing serially upward through said sections is thoroughly agitated, a pipe leading from the bottom of the boiler and connected with the lower section of each tier only to lead the cold water thereto, an independent pipe leading from the top section of each tier and passing vertically through the interior of the boiler to discharge the heated water at the top thereof, and a flue surrounding each pipe, said flues passing entirely through the boiler and connecting the combustion-chamber with the atmosphere at the top of the boiler.

40 3. In a water-heater, the combination with a vertical tubular boiler, of standards for supporting said boiler, a cylindrical shell surrounding said standards and forming a combustion-chamber below said boiler, a plurality of burners arranged in the same horizontal plane at the bottom of the combustion-chamber, a supply-pipe for said burners surrounding the chamber at the exterior thereof, an independent valve controlling each burner, a

vertical tier of flat annular water-sections disposed above each burner, a pipe connecting the lower part of the boiler with the lower section of each tier, the sections of each tier being connected serially together, whereby the water from the lower section passes vertically upward to the top section, while being heated, an independent pipe leading from each top section vertically upward through the interior of the boiler to deliver the heated water to the top thereof, and a flue surrounding each pipe, said flues connecting the combustion-chamber with the atmosphere at the top of the boiler.

60 4. In a water-heater, the combination with a vertical tubular boiler, of standards upon which said boiler is mounted, a cylindrical shell surrounding said standards to form a combustion-chamber below said chamber, a plurality of burners arranged in the same horizontal plane at the bottom of the combustion-chamber, a supply-pipe for said burners encircling said chamber at the exterior thereof, an independent controlling-valve for each burner, a vertical tier of flat, annular and thin-walled water-sections disposed above each burner, inlet and outlet openings for said sections connected together, said inlet and outlet openings being disposed on diametrical lines angularly displaced at right angles to each other whereby the water flowing through the tier is thoroughly agitated, a pipe connecting the lower part of the boiler with the lowest section of each tier, an independent pipe leading from each top tier through the interior of the boiler to discharge the heated water at the top thereof, and a flue surrounding each pipe and connecting the combustion-chamber with the atmosphere at the top of the boiler.

In witness whereof I hereunto subscribe my name this 18th day of August, A. D. 1904.

DANIEL JOHN F. BUCK.

Witnesses:

HARVEY L. HANSON,  
HENRY J. BUCK.