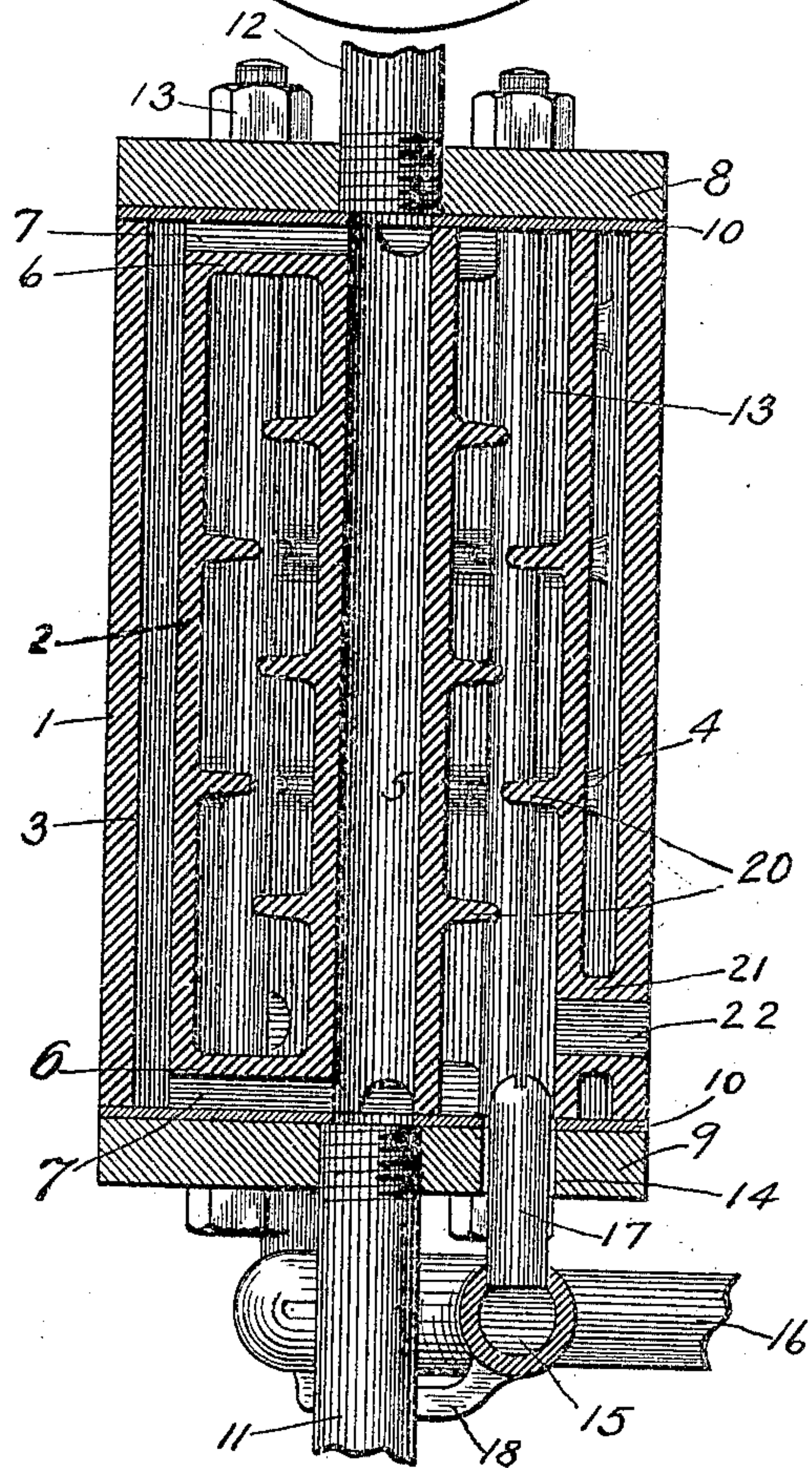
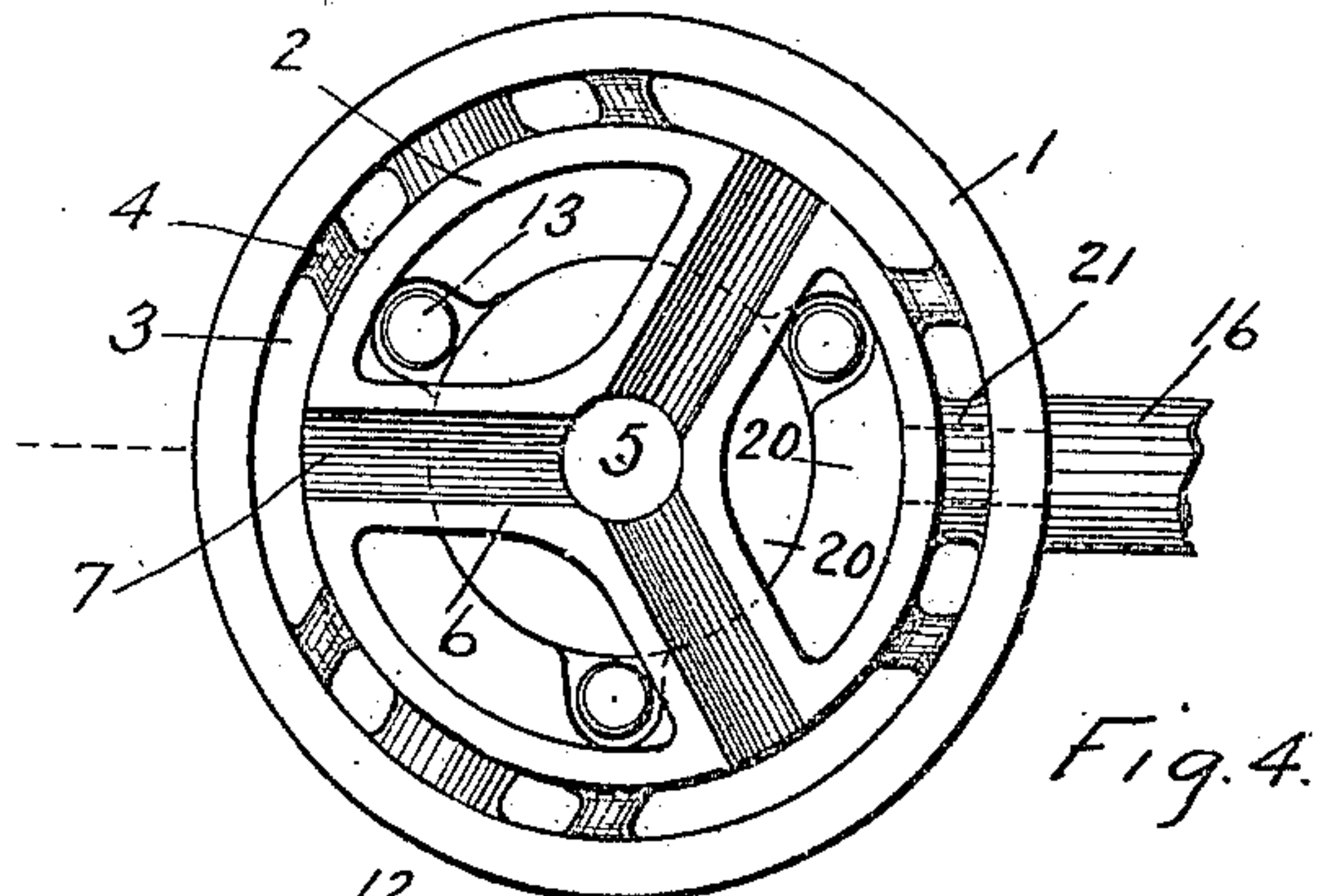
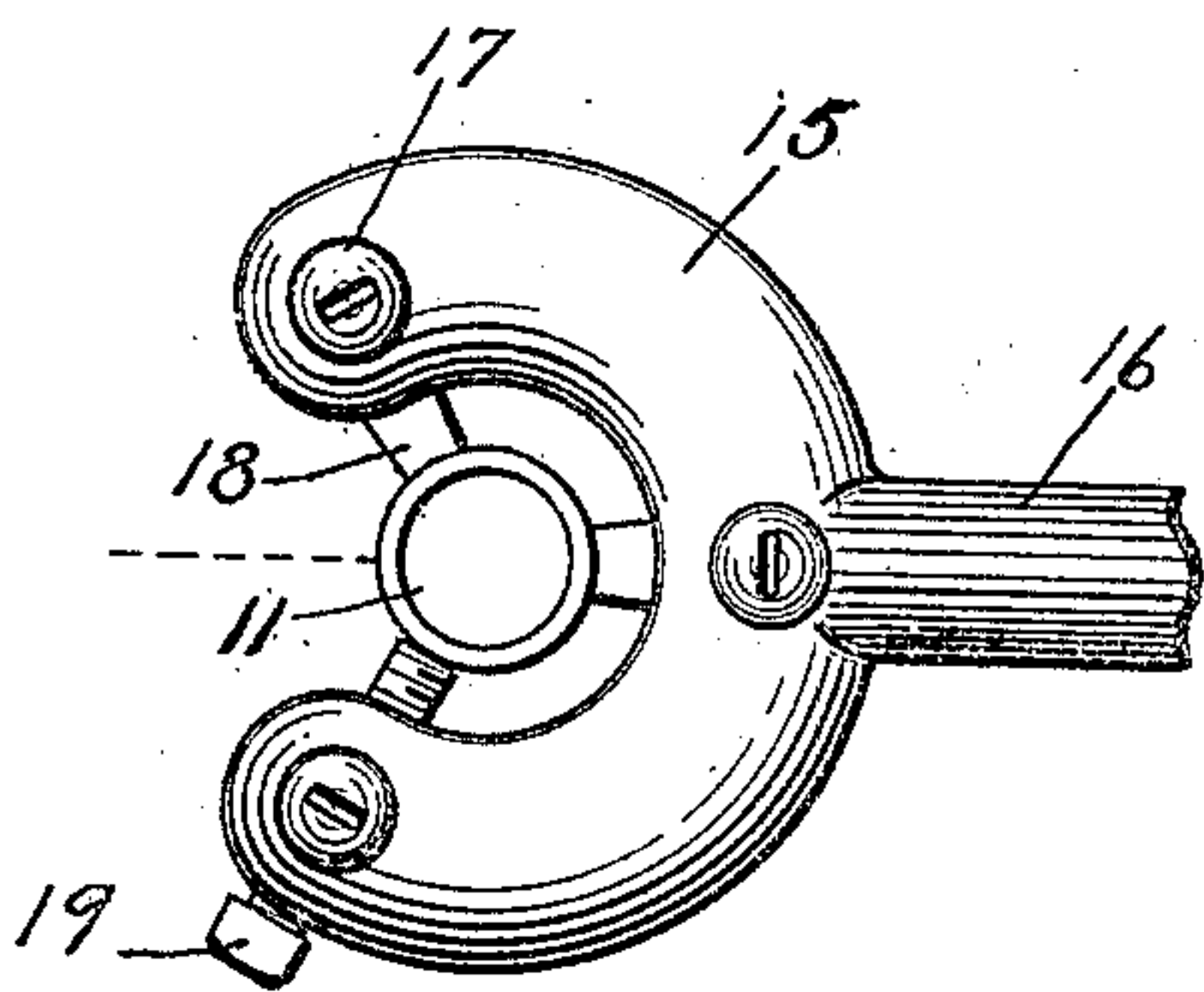
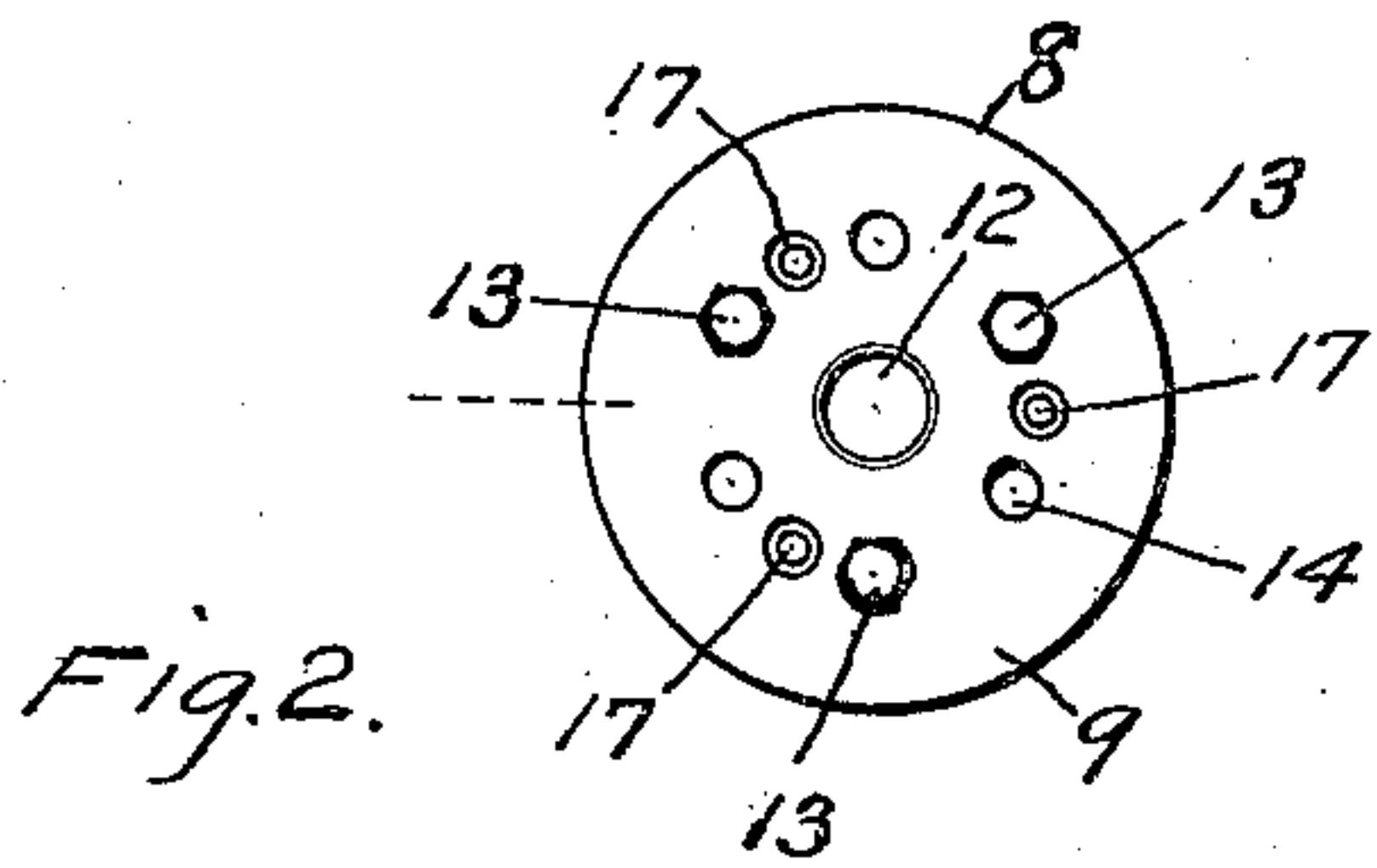
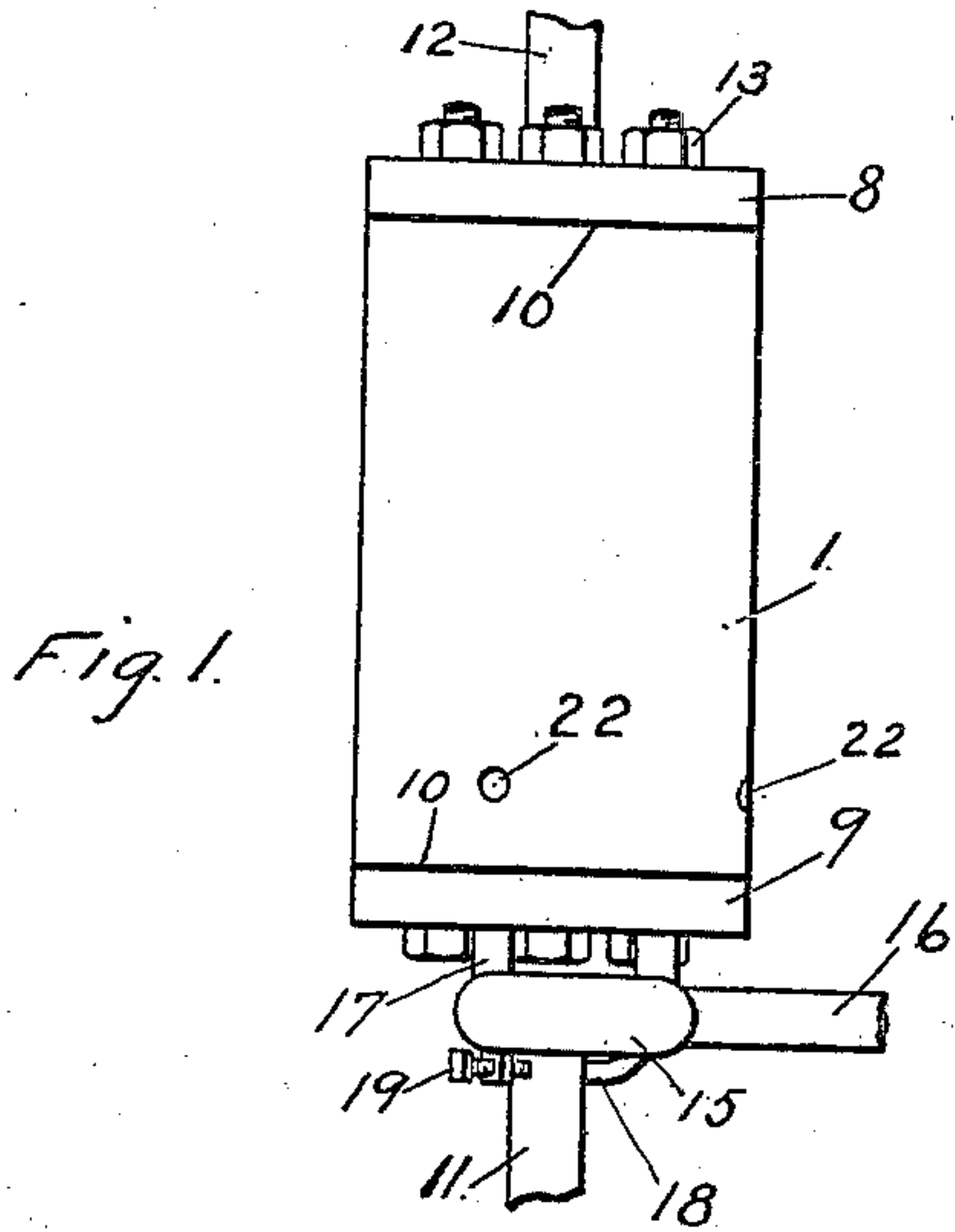


W. S. BULLARD.
WATER HEATER.
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951,904.

Patented Mar. 15, 1910.



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Witnesses:

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WATER-HEATER.

951,904.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WALTER S. BULLARD, a citizen of the United States, residing at Middletown, Butler county, Ohio, have invented certain new and useful Improvements in Water-Heaters, of which the following is a specification.

This invention, pertaining to improvements in water heaters to be operated by gas will be readily understood from the following description taken in connection with the accompanying drawing in which:—

Figure 1 is a front elevation of a heater exemplifying my invention: Fig. 2 a plan of the same. Fig. 3 a vertical longitudinal section. Fig. 4 a plan with the upper head removed: and Fig. 5 a plan of the burner.

In the drawing:—1, indicates a cylindrical metallic outer shell: 2, an inner shell concentric with the outer shell and having the same length: 3, an annular water space formed between the two shells: 4, studs extending across the water space and connecting the two shells, the two shells being cast together: 5, a tube extending axially through the shell structure and having the same length as the shell: 6, radial arms extending from the upper and lower ends of the central tube to the upper and lower ends of the inner shell, both shells and the central tube and the arms being cast as one piece: 7, radial water passages in the arms 6, these passages placing the central tube in communication with the annular water space 3 at their upper and lower ends, these radial channels being formed in the outer surfaces of the arms: 8, the upper head, seating upon the top of the outer shell and inner shell and central tube and upon the upper radial arms: 9, the lower head, similarly seated at the lower end of the body of the structure: 10, gaskets interposed between the heads and the body of the structure: 11, an inlet water pipe screwed into the lower head in line with the central tube: 12, an outlet water pipe screwed into the upper head in line with the central tube: 13, bolts extending through the heads and through the annular space surrounding the central tube, these bolts serving to clamp the heads tightly to the body of the structure and prevent leakage of water therefrom: 14, a series of holes through each of the heads, communicating with the body-space surrounding the central tube, there being a group of these holes in

each head between each pair of radial arms, the bolts 13 passing through one hole of each group: 15, a burner having the form of a partial ring surrounding the water inlet pipe 11: 16, the gas inlet to the burner: 17, the burner tips, extending up from the body of the burner into one of the holes 14 in each group of holes in the lower head: 18, radial spurs projecting inwardly from the body of the burner and engaging against the surface of the water inlet pipe: 19, a radial set screw passing through a lug on the body of the burner and impinging against the water inlet pipe and cooperating with spurs 18 in clamping the burner to the pipe: 20, annular shelves projecting inwardly from inner shell 2 and outwardly from the central tube, there being a number of these shelves, those on the inner shell alternating, in vertical position, with those on the central tube, and those on the inner shell being notched to permit the passage of the bolts 13: 21, bosses cast with the shell structure and extending across the water space: and 22, holes extending through these bosses and through the double shell and so positioned, angularly, that they will be over the burner tips.

When working, water under pressure fills the annular water space 3 and the central tube, the water freely circulating through the channels 7. The hot gases from the burner tips part with their heat outwardly through the inner shell and inwardly through the central tube, the annular shelves serving to somewhat retard the upward passage of the gases and also aiding in the transmission of the heat to the water. The air for combustion enters through these holes in the lower head which are not occupied by burner tips or by bolts and departs through those holes 14 in the upper head which are not occupied by bolts. The burner tips may be lighted by means of a match passed through holes 22. The burner is supported by the inlet water pipe and is readily removed therefrom by sufficiently loosening screw 19.

In practice I find no machine work necessary in the construction of the general heater structure, except tapping of the heads to receive the water pipes, the parts being otherwise assembled just as they come from the foundry.

The extreme cheapness and simplicity of

the device will be at once recognized. But the two most important points in connection with this structure are, first, that there is no outward radiation of the applied heat, owing to the fact that the heat is applied exclusively within the water-surrounded parts of the structure; and, second, when the heads are removed all the interior parts of the body of the heater are accessible to cleaning, a very important matter when the heater is used in connection with water carrying much lime.

I claim:

1. The combination of an outer shell, an inner shell separated from the outer shell to form a water space, a tube within the inner shell separated therefrom to form a heating space, studs connecting the inner and outer shells, arms connecting the tube and the inner shell, water passages through the arms connecting the tube with the water space between the shells, separate upper and lower heads resting upon the upper and lower ends of the shell structure and forming closures for the water space, tube and heating space, through bolts extending through the heating space and serving to secure the heads in position, water supply and discharge connections passing through the heads, a gas burner passing through the lower head and entering the heating space, the upper head being provided with apertures for the escape of products of combustion.

2. A water-heater comprising, an outer shell, an inner shell having the same length as the outer shell and disposed therein so as to form an annular water-space between the two shells, an open-ended tube disposed axially within the inner shell, arms projecting rigidly from the ends of the tube radially into rigid connection with the inner shell and having water-passages connecting the interior of the tube with the annular water-space, heads secured against the ends of the shells and tube and closing the ends of the water-space, a water inlet-pipe-connection communicating with one end of the water-space and tube, a water outlet pipe-connec-

tion communicating with the opposite end of the water-space and tube, and a gas-burner arranged to apply heat to the interior of the inner shell and the exterior of the tube, combined substantially as set forth.

3. A water-heater comprising, an outer shell, an inner shell having the same length as the outer shell and disposed therein so as to form an annular water-space between the two shells, an open-ended tube disposed axially within the inner shell, arms projecting rigidly from the ends of the tube radially into rigid connection with the inner shell and having outwardly open water-passages connecting the interior of the tube with the annular water-space, heads secured against the ends of the shells and tube and closing the ends of the water-space and forming outer walls for said water-passages, a water inlet pipe-connection communicating with one end of the water-space and tube, a water outlet pipe-connection communicating with the opposite end of the water-space and tube, and a gas-burner arranged to apply heat to the interior of the inner shell and the exterior of the tube, combined substantially as set forth.

4. A water-heater comprising, a closed vertical shell structure containing a water-space and a space for the passage of burner-products, a water outlet-pipe communicating with the upper end of the water-space, a water inlet-pipe centrally disposed in the base of the structure and communicating with the base of the water-space, a gas-burner in the form of a gapped ring loosely surrounding the water inlet-pipe, spurs projecting inwardly from the burner to position the burner upon the pipe, and a set-screw projecting inwardly from the burner and adapted to engage the inlet-pipe and cooperate with said spurs in clamping the burner to the pipe, combined substantially as set forth.

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Witnesses:

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