No. 828,394. PATENTED AUG. 14, 1906.

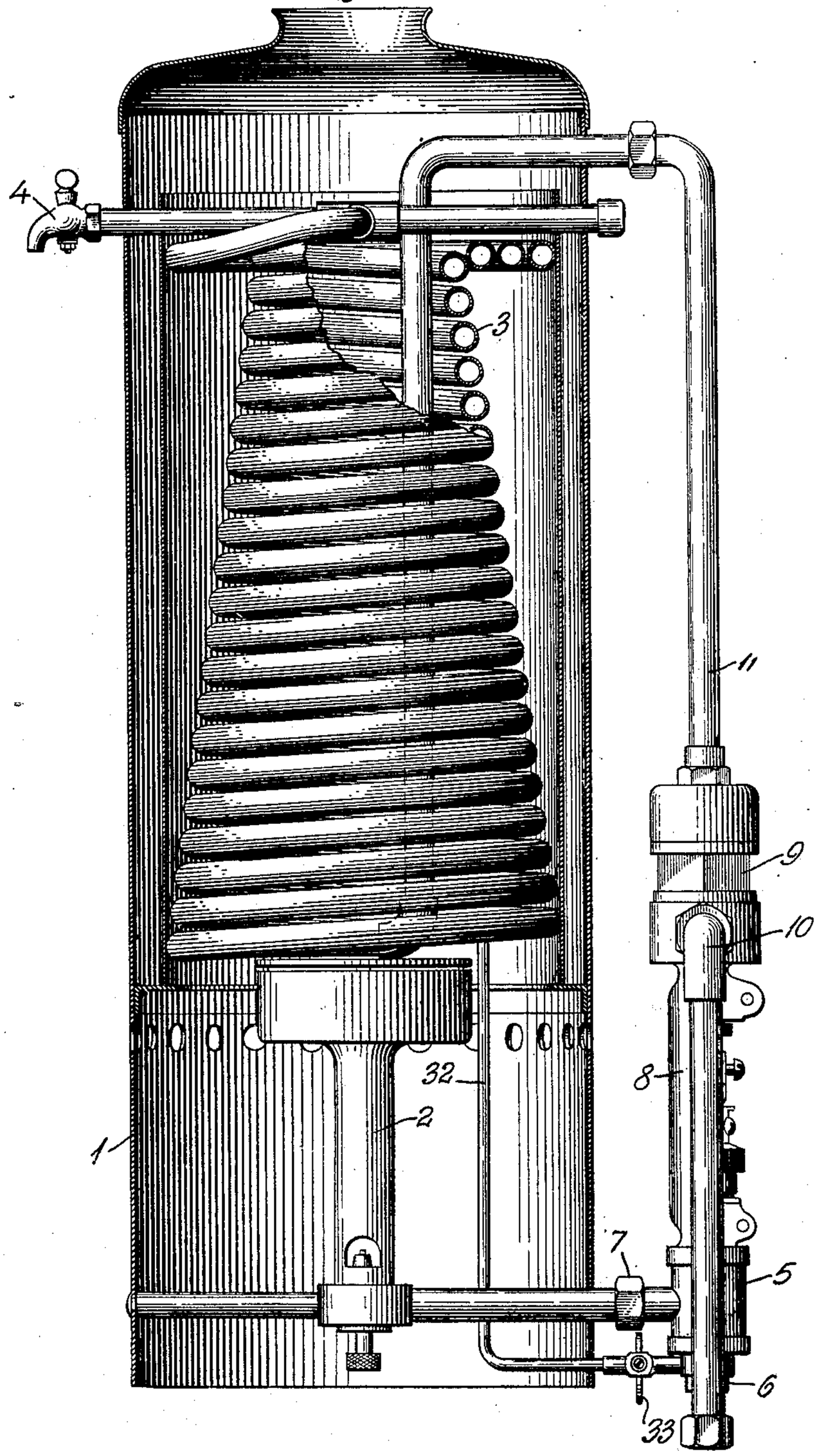
G. R. FICKERT.

WATER HEATER.

APPLICATION FILED NOV. 2, 1904.

3 SHEETS—SHEET 1.

Fig: 1



Witnesses
Geom. Harris.
John O. Gempler.

Inventor
Gustav Richard Fickert.
By his Attorney J. H. Freeman

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3 SHEETS—SHEET 2.

Fig: 2

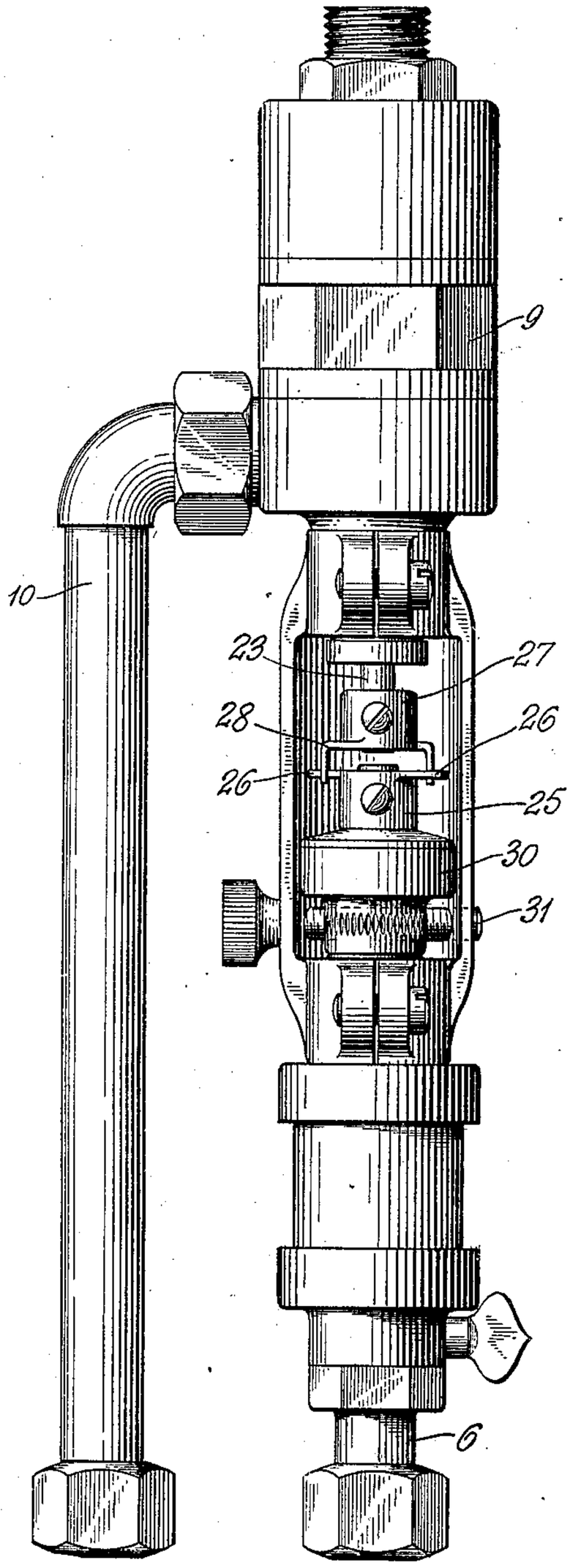
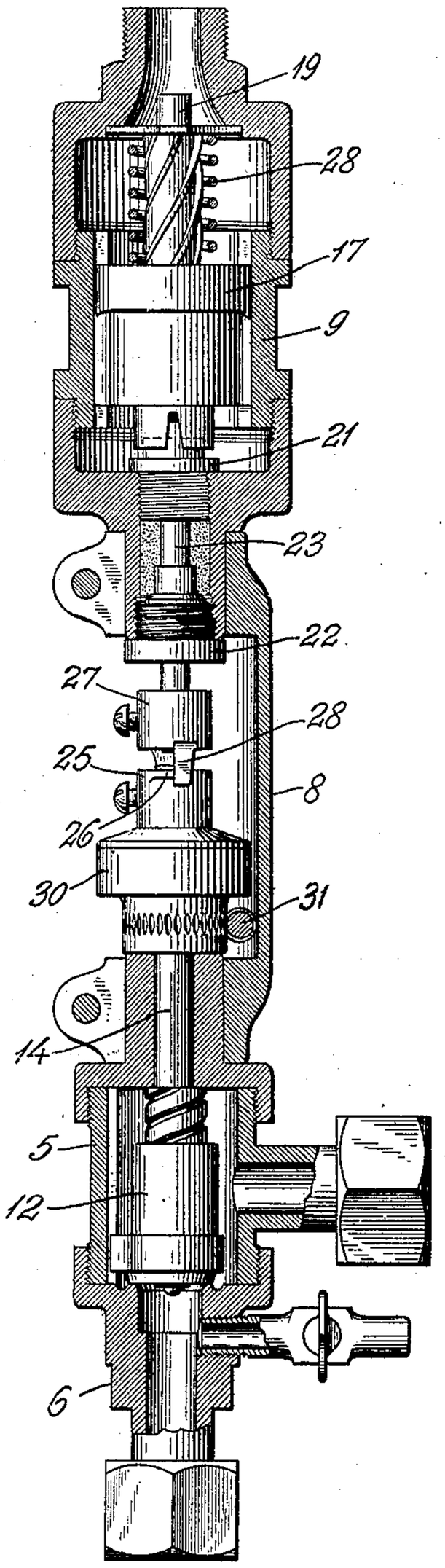


Fig: 3



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3 SHEETS—SHEET 3.

Fig: 4

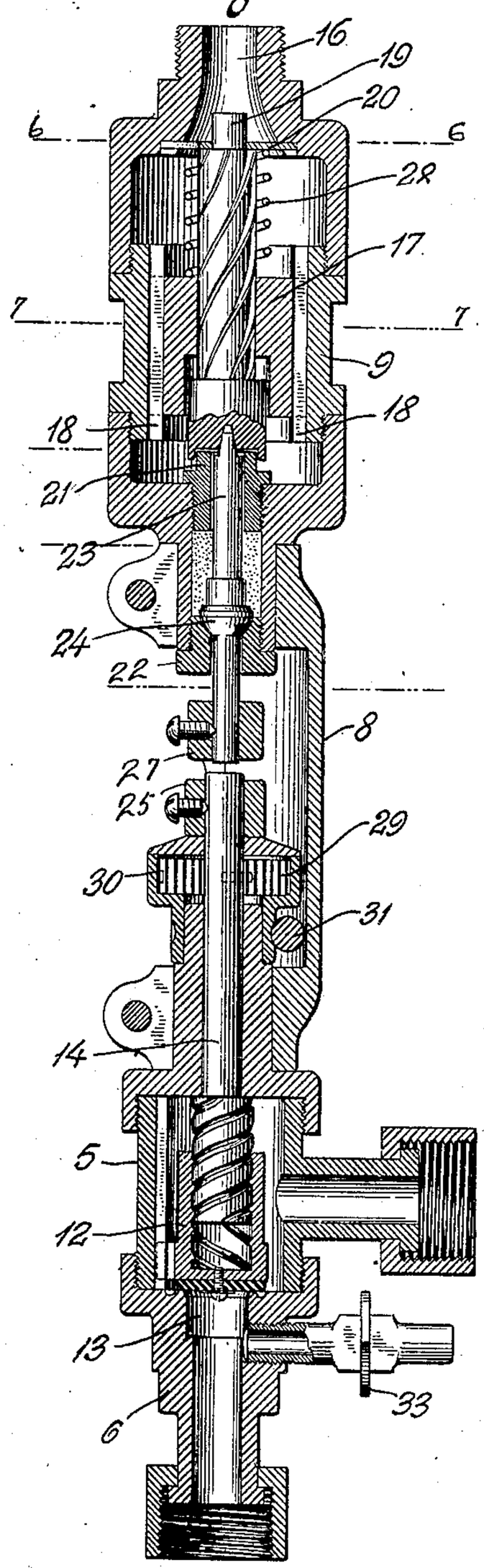


Fig: 5

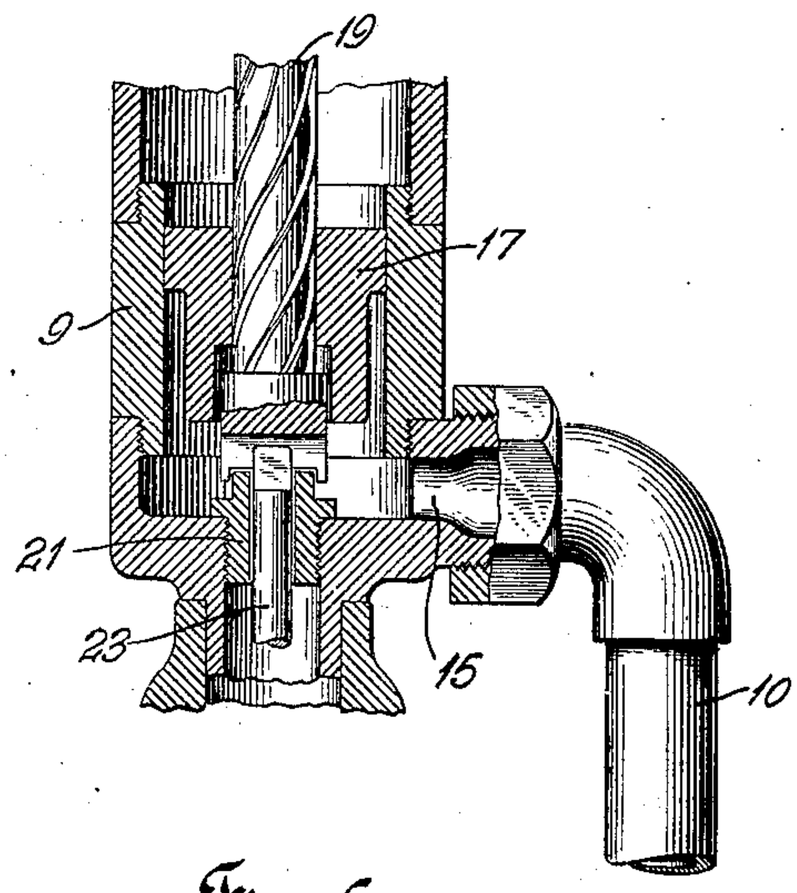


Fig: 6

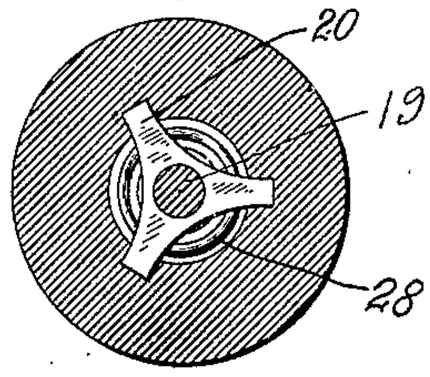
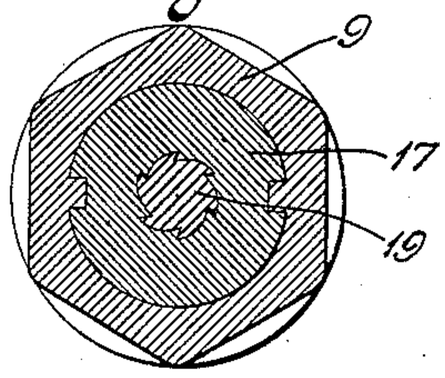


Fig: 7



Witnesses
Geo. M. Harris.
John C. Temples.

Inventor
Gustav Richard Fickert
By his Attorney J. H. Freeman

UNITED STATES PATENT OFFICE.

GUSTAV RICHARD FICKERT, OF JERSEY CITY, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO HORACE M. KILBORN, OF NEW YORK, N. Y.

WATER-HEATER.

No. 828,394. Specification of Letters Patent. Patented Aug. 14, 1906.

Application filed November 2, 1904. Serial No. 231,039.

To all whom it may concern:

Be it known that I, GUSTAV RICHARD FICKERT, a citizen of the United States, and a resident of and whose post-office address is Jersey City, Hudson county, New Jersey, have invented a certain new and useful Improvement in Water-Heaters, of which the following is a specification.

My invention relates to water-heaters, and more particularly to such water-heaters as are employed for heating water in comparatively small quantities for domestic purposes by means of gas.

An object of my invention it to provide a water-heater of the class referred to the supply of heat to which is automatically controlled by the simple act of drawing water through the heater, and more particularly to provide an automatic valve-operating mechanism which shall occupy a minimum of space and which may be set or adjusted to operate with varying water-pressures, and also to provide a valve mechanism which shall be uniform and reliable in operation and not apt to get out of order. These and other objects of my invention will more fully appear from the following description.

My invention consists in the novel parts, improvements, and combinations herein shown and described.

The accompanying drawings, which are referred to herein and form a part hereof, illustrate one embodiment of my invention and serve, in connection with the description herein, to explain the principles thereof.

Of the drawings, Figure 1 is a side elevation of a water-heater embodying my invention, the main casing of the heater and part of the heating-coil being in vertical central section. Fig. 2 is an elevation of the automatic valve-operating mechanism as seen from the rear of the heater or from the right in Fig. 1. Fig. 3 is a vertical central section through the casing of the valve and valve-operating mechanism, the movable parts being shown in side elevation. Fig. 4 is a vertical central section through the valve and valve-operating mechanism with certain of the movable parts in elevation. Fig. 5 is a vertical central section illustrating a detail; and Figs. 6 and 7 are horizontal sections taken, respectively, on the lines 6 6 and 7 7 of Fig. 4.

Like numbers of reference indicate like parts in the several views.

Referring to the particular embodiment of my invention illustrated in the drawings, 1 represents the main casing of the heater, inclosing both the burner 2 and the water-heating receptacle 3. Any suitable burner may be employed, although I prefer a burner of the Bunsen type, as indicated in the drawings. Any suitable means having water-heating surfaces may be employed for transmitting the heat of the burner to the water. Preferably, however, a receptacle adapted to contain the water under pressure, such as the coil 3, is used. In accordance with the preferred construction also the water-heating coil is frusto-conical in form, the base of the frustum being arranged just above the burner and the pipe at the upper end thereof being continued in the form of a flat coil, as indicated, and terminating in a service-faucet 4. The automatic valve mechanism includes a casing 5, containing a fuel-controlling valve and being connected with the gas-supply pipe at 6 and with the burner 2 at 7. Rigidly connected with the casing 5 by means of the bracket 8 is a casing 9, the same being connected at its lower end with the service-pipe 10 and at its upper end with a pipe-section 11, leading to the heating-coil 3.

Any suitable form of fuel-controlling valve may be employed. In accordance with the preferred construction, as shown, the fuel-valve consists of a non-rotating reciprocating member 12, adapted to be seated on the mouth of the inlet-port 13. For the purpose of reciprocating the valve to control the flow of gas the member 12 is provided with an internally-threaded opening, to which the lower threaded end of a non-reciprocating stem 14 is fitted, said stem passing upwardly through an elongated opening in the upper end of the valve-casing 5.

In accordance with the embodiment of my invention illustrated the casing 9 is formed with a piston-chamber communicating at its lower end with the inlet-port 15 (see Fig. 5) and at its upper end with the outlet-port 16. Fitted for longitudinal movement in said piston-chamber is a piston 17, adapted when in its lowermost position to interrupt communication between the inlet and outlet ports and when in its uppermost position to estab-

lish communication between said ports. Any suitable connections may be provided between said piston and the rotary valve-operating member.

In accordance with the preferred construction and as illustrated, however, the piston 17 is confined against rotation, as by means of one or more longitudinal splines 18, having corresponding grooves in the sides of the piston. Any suitable means may be employed for transforming the longitudinal movement of the piston into a rotary movement for operating the fuel-controlling valve. As shown, the piston is provided with a central longitudinal opening having a spiral or thread of steep pitch, to which is fitted a correspondingly threaded or spiraled stem or spindle 19, mounted to rotate on an axis parallel with the line of movement of the piston held against longitudinal movement within the casing. The spiral means whereby the longitudinal movement of the piston causes a rotary movement of the spindle is, as shown, made of a steep pitch, so that a comparatively slight force acting upon the piston will exert a strong turning effort upon the spindle 19 and stem 14, the reliable operation of the device even under a low water-pressure being thus insured. Preferably the pitch of this spiral means is greater than that of the threaded connection between the stem 14 and the fuel-valve 12 where such threaded connection is used. Any suitable connections may be provided between the spindle 19 and the stem 14.

As shown, the spindle 19 is journaled at its upper end in a spider-frame 20, (see Figs. 4 and 6,) seated in the mouth of the outlet-port, and said spindle is confined at its lower end by means of a bushing 21, threaded in a suitable opening in the lower end of the casing 9 and entering a socket in the lower end of the spindle 19. Passing through the bushing 21 and a similar bushing 22 at the lower end of the casing 9 is a rotating stem 23, having a flattened upper end entering a corresponding transverse recess in the lower end of the spindle 19. The stem 23, as shown, is provided with a shoulder 24, having a tapered bearing-surface seated in the corresponding recess in the bushing 22 and adapted to form a hermetic joint therewith under the pressure of the water in the casing 9.

The space between the bushings 21 and 22 is preferably filled with a heavy grease, such as vaseline, to lubricate the joint between the stem and the bushing 22 and render the same perfectly water-tight. For the purpose of avoiding friction and possible unseating of the joint between the stem 23 and the bushing 22 a loose coupling connection is provided between the stem 23 and the stem 14. Any suitable coupling may be used. As shown, the stem 14 is provided with a collar 25, having oppositely-arranged radial arms 26, and a collar 27 is fixed to the ends of the stem 23, said collar having oppositely-arranged arms adapted to engage the arms 26 of the collar 25.

The operation of the device is as follows: When water is drawn through the heater, the pressure will be reduced on the upper side of the piston 17, and the pressure from the water-main will operate to move the piston 17 upwardly until communication is established between the inlet and outlet ports. The upward motion of the piston 17 will rotate the spindle 19 and through it the spindles 23 and 14, thereby raising the fuel-valve. When the water is turned off, the piston 17 may operate through its own weight to return the ports to their normal position. To render the operation of the device certain, however, a spring 28 may be confined between the piston 17 and the spider-frame 20, so as to be compressed by the upward motion of the piston and by its expansion to assist in the downward motion thereof.

In order to overcome the friction effect of varying pressures of water upon the joint 24 between the stem 23 and the bushing 22, I preferably employ in addition to the spring 28 an adjustable spring for assisting in the return movement of the piston. As shown, a coil-spring 29 is fastened at one end to the stem 14, preferably at a point without the casing 5, the other end of said spring being secured to the inner surface of a spring-inclosing case 30, suitably journaled on the end of the case 5 in concentric relation with the stem 14. For the purpose of turning the case 30 so as to vary the tension of the spring 29 the latter is provided with worm-teeth adapted to be engaged by a worm or screw 31, horizontally journaled in the bracket 8, as clearly shown in Fig. 2.

A pilot-light 32 for the burner 2 is connected with the gas-supply beneath the valve 12, as clearly indicated in Fig. 1, a valve 33 being provided to control the supply to the pilot.

My invention in its broader aspects is not limited to the precise construction shown and described, as many changes may be made in the details thereof without departing from the main principles of the invention and without sacrificing its chief advantages.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An automatic valve mechanism for water-heaters, including in combination a valve for controlling the supply of fuel to the heater, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber adapted to be moved by the water-pressure to establish communication between said ports, and connections between said piston and said valve, said connections includ-

ing a rotary member and spiral means whereby the movement of the piston actuates said rotary member.

2. An automatic valve mechanism for water-heaters, including in combination a valve for controlling the supply of fuel to the heater, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a non-rotating piston in said chamber adapted to be moved by the water-pressure to establish communication between said ports, and connections between said piston and said valve, said connections including a rotary member mounted to rotate on an axis parallel with the line of movement of the piston and means whereby the non-rotary movement of the piston in the piston-chamber actuates said rotary member.

3. An automatic valve mechanism for water-heaters, including in combination a valve for controlling the supply of fuel to the heater, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber adapted to be moved by the water-pressure to establish communication between said ports, means for returning the piston to interrrupt communication between said ports, and connections between said piston and said valve, said connections including a rotary member mounted to rotate on an axis parallel with the line of movement of the piston and spiral means whereby the movement of the piston actuates said rotary member.

4. An automatic valve mechanism for water-heaters, including in combination a valve for controlling the supply of fuel to the heater, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber adapted to be moved by the water-pressure to establish communication between said ports, a spring for returning said piston to interrupt communication between said ports, means for varying the force with which said spring operates, and connections between said piston and said valve, said connections including a rotary member and spiral means whereby the movement of the piston actuates said rotary member.

5. An automatic valve mechanism for water-heaters, including in combination a valve for controlling the supply of fuel to the heater, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber adapted to be moved by the water-pressure to establish communication between said ports, a spring for returning said piston to interrupt communication between said ports, means for varying the force with which said spring operates, and connections between said piston and said valve, said connections including two rotary members, one being threaded to said piston and the other to said valve, whereby the movement of said piston is communicated to the valve by rotary motion.

6. An automatic valve mechanism for water-heaters, including in combination a valve for controlling the supply of fuel to the heater, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber adapted to be moved by the water-pressure to establish communication between said ports, a spring for returning said piston to interrupt communication between said ports, means for varying the force with which said spring operates, and connections between said piston and said valve, said connections including two rotary members loosely coupled together, one of said members being threaded to said piston and the other to said valve.

7. An automatic valve mechanism for water-heaters, including in combination a valve for controlling the supply of fuel to the heater, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber adapted to be moved by the water-pressure to establish communication between said ports, a spring for returning said piston to interrupt communication between said ports, means including a screw and worm-wheel for varying the force with which said spring operates, and connections between said piston and said valve, said connections including a rotary member, and means whereby the movement of the piston actuates said rotary member.

8. An automatic valve mechanism for water-heaters, including in combination a valve-casing, a valve in said casing, a rotary valve-operating member projecting through said casing, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber, a rotary member having operative connection with said piston and projecting through said piston-chamber casing, means for securing said casings together with said rotary members in substantial alinement, and a loose coupling between said rotary members.

9. An automatic valve mechanism for water-heaters, including in combination a valve-casing, a valve in said casing, a rotary valve-operating member projecting through said casing, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber, a rotary member having operative connection with said piston and projecting through said piston-chamber casing, means for securing said casings together with said rotary members in substantial alinement, a coupling between said rotary members adapted to cause the valve-

operating member to rotate in one direction with the piston-operated member, a spring for actuating said valve-operating member in the opposite direction, and means for adjusting the tension of said spring.

10. An automatic valve mechanism for water-heaters, including in combination a valve-casing, a valve in said casing, a rotary valve-operating member projecting through said casing, a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber, a rotary member having operative connection with said piston and projecting through said piston-chamber casing, means for securing said casings together with said rotary members in substantial alinement, a coupling between said rotary members whereby the valve-operating member is caused to rotate in one direction with the piston-operated member, a spring for actuating said valve-operating member in the opposite direction, one end of said spring being connected to said valve-operating member outside of the valve-casing, a spring-inclosing case to which the other end of said spring is secured, said spring-inclosing case being rotatively mounted so as to vary the tension of said spring, and means for rotating said spring-inclosing case.

11. In a water-heater, the combination of means having a water-heating surface, a burner, a valve for controlling the supply of fuel to the burner, and means for automatically operating the said valve, comprising a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a piston in said chamber adapted to be moved by the water-pressure to establish communication between said ports, and connections between said piston and said valve, said connections including a rotary member and spiral means whereby the movement of the piston along the piston-chamber actuates said rotary member.

12. In a water-heater, the combination of means having water-heating surfaces, a burner, a valve for controlling the supply of fuel to the burner, and means for automatically operating said valve, comprising a casing having a piston-chamber and inlet and outlet ports communicating with the opposite ends of said chamber, a non-rotating piston in said chamber adapted to be moved by water-pressure to establish communication between said inlet and outlet ports, means independent of the water-pressure for returning said piston, and connections between said piston and said valve, said connections including two rotary members, one being threaded to said piston and the other being threaded to said valve and a loose coupling between said rotary members.

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

GUSTAV RICHARD FICKERT.

Witnesses:
J. H. FREEMAN,
EDWIN SEGER.