

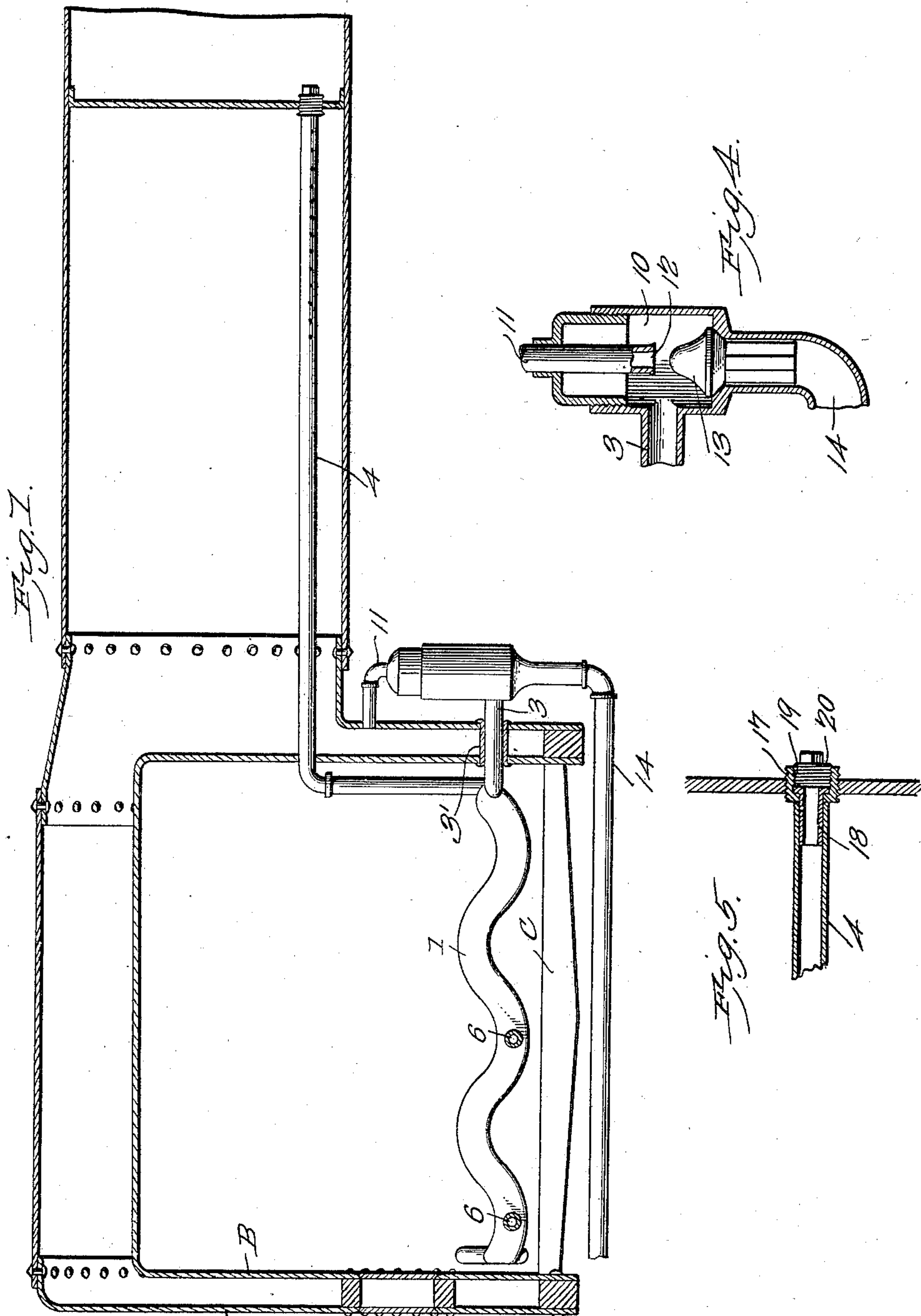
No. 701,518.

Patented June 3, 1902.

F. W. SHUPERT.
FEED WATER HEATER.
(Application filed Dec. 12, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
E. J. Stewart
J. W. C. Parker

F. W. Shupert, Inventor.
by *C. A. Snow*
Attorneys

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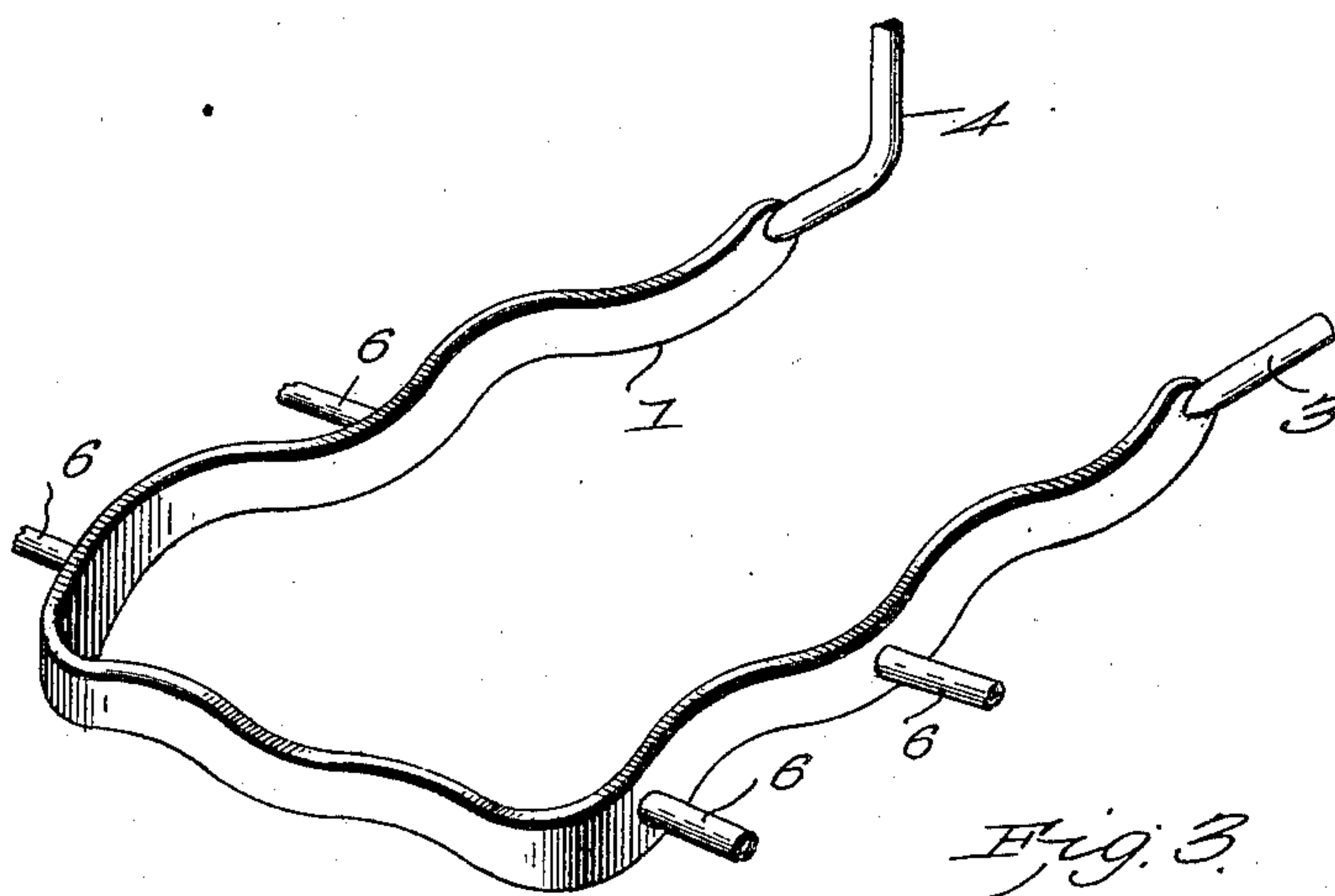
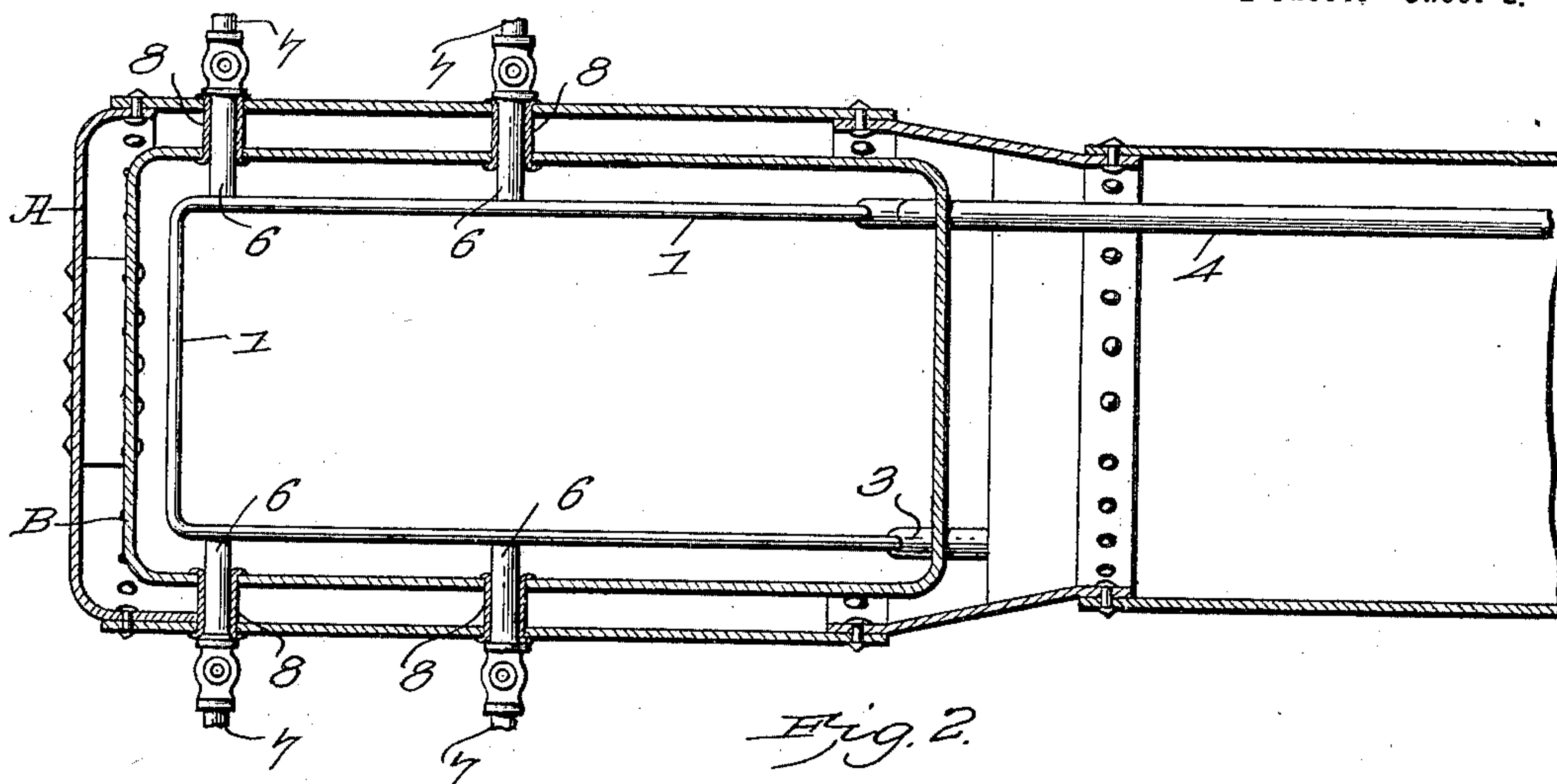
Patented June 3, 1902.

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FEED WATER HEATER.

(Application filed Dec. 12, 1901.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
E. J. Hewitt
John E. Parker

F. W. Shupert, Inventor.
by *C. A. Snow & Co.*
Attorneys

UNITED STATES PATENT OFFICE.

FRANK W. SHUPERT, OF SPOKANE, WASHINGTON.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 701,518, dated June 3, 1902.

Application filed December 12, 1901. Serial No. 85,665. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. SHUPERT, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented a new and useful Feed-Water Heater, of which the following is a specification.

My invention relates to certain improvements in steam-boilers of that type in which a feed-water heater is located directly in the fire-box of the boiler in order to heat the feed-water prior to its entrance to the boiler and at the same time to set up an auxiliary circulation between different parts of the boiler.

The principal object of the invention is to provide an improved feed-water heater and circulator of this class in which the feed-water from the tender of a locomotive or other source of supply is passed through flattened pipes arranged in the lower portion of the fire-box and in constant contact with the fuel.

A further object of the invention is to provide for the support of such pipes at intervals by short pipes passing through the walls of the fire-box and the outer shell of the boiler, such pipes being adapted to act not only as supports, but as blow-offs to remove any accumulation of sediment or scale in the pipes; and a still further object of the invention is to so construct the heating-pipes as to at all times insure constant contact with the fuel without regard to the depth of fuel on the fire-grate.

Further objects and advantages of the invention will be apparent from a reading of the following description.

In the accompanying drawings, Figure 1 is longitudinal sectional elevation of a locomotive-boiler, illustrating a feed-water heater constructed and arranged in accordance with my invention. Fig. 2 is a sectional plan view of the same. Fig. 3 is a detached perspective view of the main heating-pipe, which is located within the fire-box. Fig. 4 is a sectional elevation, on an enlarged scale, illustrating a construction of double check-valve which I employ in connection with the heater. Fig. 5 is a detail sectional view illustrating the connection between the outlet end of the feed-water pipe and the front flue-sheet of the boiler.

Similar numerals of reference are employed to designate corresponding parts throughout the several figures of the drawings.

A designates the shell of an ordinary form of locomotive or other boiler, and B the walls of a fire-box, having at the lower end an ordinary form of grate C.

Within the fire-box, at a point adjacent to the walls thereof and immediately above the grate-bars, is a feed-water-heating pipe 1 of substantially U shape in plan and connected at one end to an inlet-pipe 3, which extends through a thimble 3' in the wall of the fire-box and the shell of the boiler and at the opposite end being connected to a discharge-pipe 4, which extends through the lower portion of the boiler, to the front flue-sheet thereof. The heating-pipe is formed of a piece of round pipe slightly flattened on its opposite sides and presenting a substantially elliptical form in cross-section in order to reduce the width of the body of water passing through the pipe, so that it may be more readily heated. The pipe is bent in serpentine form, as indicated in Figs. 1 and 3, in order to increase the length of time which it will take for a body of water to pass through the pipe and at the same time to insure contact with the fire at all times. In firing the burning fuel is sometimes elevated in spots by a bed of ashes, and if the pipe were perfectly horizontal it might become covered with ashes and prevent the heating of the water. By making the pipe in a serpentine or waved line contact with some portion of the fuel is at all times insured. The lower bends of the pipe are connected by short pipe-sections 6 to valved outlet-pipes 7, through which any sediment or scale may be discharged, the short pipes passing through suitable thimbles 8 in the water-space between the wall of the fire-box and the boiler-shell and serving not only as blow-off pipes, but acting to support the heating-pipe in proper position.

The end of the feed-pipe 3 is in communication with the central chamber 10 of a check-valve, the construction of which is more clearly shown in Fig. 4. One end of the check-valve communicates through a pipe 11 with the water-space around the fire-box or with any other suitable portion of the boiler,

the lower end of the pipe forming a valve-seat 12, against which the upper end of the check-valve 13 may be seated. The lower end of the valve-chamber 10 communicates
5 with a pipe 14, leading from a source of supply, the water being forced through said pipe by an injector, feed-pump, or equivalent device. In the upper end of the pipe 14 is formed a valve-seat for the lower end of the
10 check-valve 12, and the shank of the latter is guided within the upper end of the pipe, as shown.

In operation a constant circulation of water is maintained through the pipe 11, the
15 valve-chamber 10, the pipe 3, the heater-pipe 1, and the discharge-pipe 4, the latter being provided with suitable perforations through which the water may escape into the boiler. When the boiler is to be supplied with water,
20 the latter is forced through the pipe 14 by an injector or other device, raising the valve 13 from its lower seat and closing it against the seat 12 in the lower end of the pipe 11. In order to insure the proper closing of the valve
25 against the seat 12, the diameter of the pipe 10 is made much less than that of the pipe 14, leading from the injector. The water enters the chamber 10 and flows through the pipe 3 and the heater-pipe 1, being finally
30 discharged through the perforations in the pipe 4.

In order to facilitate the cleaning of the discharge-pipe by means of a flue-scraper or the like, I connect the pipe to the front flue-
35 sheet by a coupling of the character more clearly shown in Fig. 5. This coupling comprises a threaded sleeve 17, adapted to a threaded opening in the flue-sheet and connected to the end of the pipe 4 by a thimble
40 18 or in any other suitable manner. The outer portion of the sleeve 17 is provided with internal screw-threads 18 for the reception of a closing-plug 20, having a square or polygonal head, to which a suitable wrench may
45 be applied when it is desired to gain access to the interior of the tube.

While the device herein described, and illustrated in the accompanying drawings, presents the invention in its preferred form, it is ob-
50 vious that many changes in the form, proportions, size, and minor details of construction may be made without departing from the spirit or sacrificing any of the advantages of my invention.

55 Having thus described my invention, what I claim is—

1. The combination in a feed-water heater, of a boiler, a fire-box, a flattened pipe adapted to be placed in the fire-box of the boiler,
60 a double check-valve, a chamber containing the same, a water-supply pipe in communication with said chamber, a circulating-pipe extending between the water-space of the boiler and said chamber, said circulating-pipe being
65 of a diameter less than the water-supply pipe, a pipe extending between said chamber and the heater-pipe, and a discharge-pipe extend-

ing from the heater-pipe to a point within the boiler.

2. The combination in a feed-water heater, 70 of a boiler, a fire-box, a single heater-pipe extending in a substantially horizontal plane within the fire-box and bent into a serpentine or waved line, means for supporting said pipe at a point immediately above the grate, and 75 supply and discharge pipes communicating respectively with the opposite ends of said pipe.

3. The combination in a feed-water heater, of a boiler, a fire-box, a heater-pipe arranged 80 within the fire-box, thimbles extending between the wall of the fire-box and the shell of the boiler, blow-off pipes connected to said heater-pipe and extending through the said thimbles, said blow-off pipes acting to sup- 85 port the said heater-pipe, and water supply and discharge pipes communicating with said heater-pipe.

4. The combination in a feed-water heater, of a boiler, a fire-box, a heater-pipe bent into 90 a serpentine or waved line and located within the fire-box, a series of supporting and blow-off pipes connected to the lower bends of the pipe and extending out through the shell of the boiler, and water supply and discharge 95 pipes communicating with said heater-pipe.

5. The combination in a feed-water heater, of a boiler, a fire-box, a heater-pipe bent into a serpentine or waved line and located within the fire-box, supporting and blow-off pipes 100 connected to the lower bends of the heater-pipe, thimbles extending between the wall of the fire-box and the shell of the boiler and forming passages for said supporting and blow-off pipes, a double check-valve, a valve- 105 chamber, containing the same, a water-supply pipe communicating with the valve-chamber and having a valve-seat at the lower end of the chamber, a circulating-pipe connecting the boiler and the check-valve chamber and 110 of a diameter less than that of the water-supply pipe, a pipe extending between the valve-chamber and one end of the heater-pipe, and an oppositely-disposed discharge-pipe extending between the opposite end of the 115 heater-pipe and the interior of the boiler.

6. In a feed-water heater, a boiler, a fire-box, a heating-pipe located within the fire-box, a water-supply pipe therefor, a water- 120 discharge pipe extending from the opposite end of the heater-pipe through the front flue-sheet of the boiler and perforated to permit of the discharge of water, a threaded sleeve to which the end of the pipe is secured, and a threaded closing-plug carried by said sleeve 125 to close the end of the pipe, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

FRANK W. SHUPERT.

Witnesses:

E. J. HOLLAND,
B. C. SECORD.