(No Model.) 3 Sheets—Sheet 1.

W. E. PRALL.

HEAT GENERATING APPARATUS.

No. 261,480. Patented July 18, 1882.

Fig 1

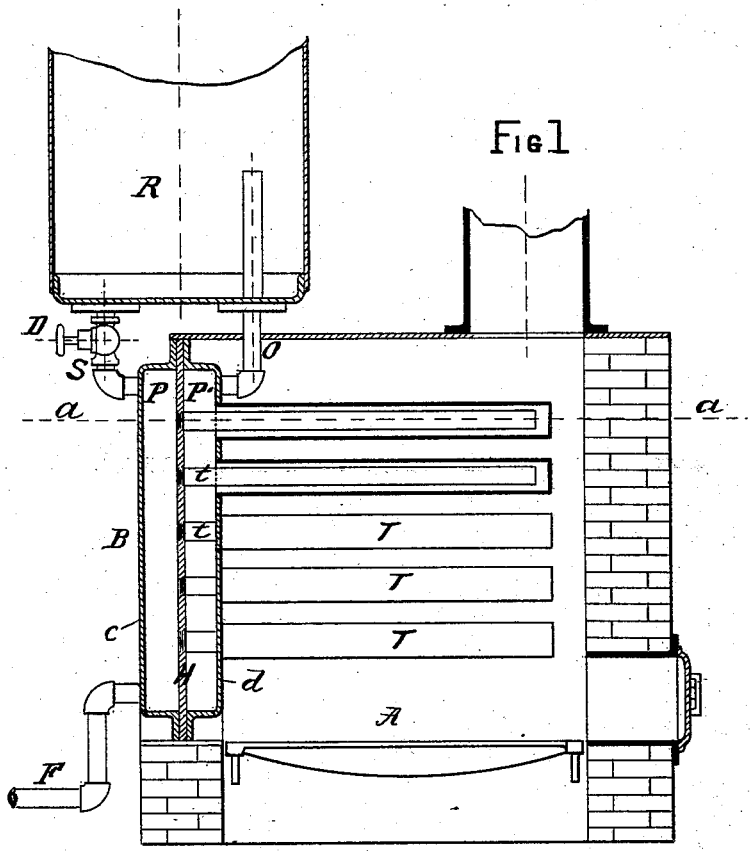
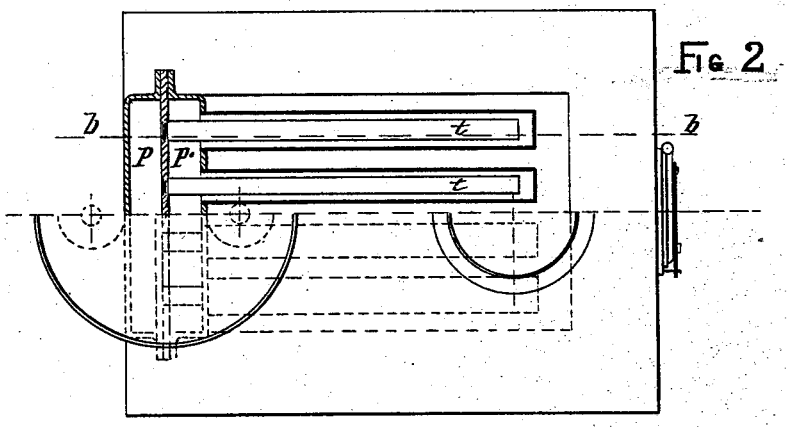


Fig. 2



WITNESSES

John Fish

T. L. Jones

INVENTOR

W. E. Prall

(No Model.) 3 Sheets—Sheet 2.

W. E. PRALL.

HEAT GENERATING APPARATUS.

No. 261,480. Patented July 18, 1882.

Fig. 3.

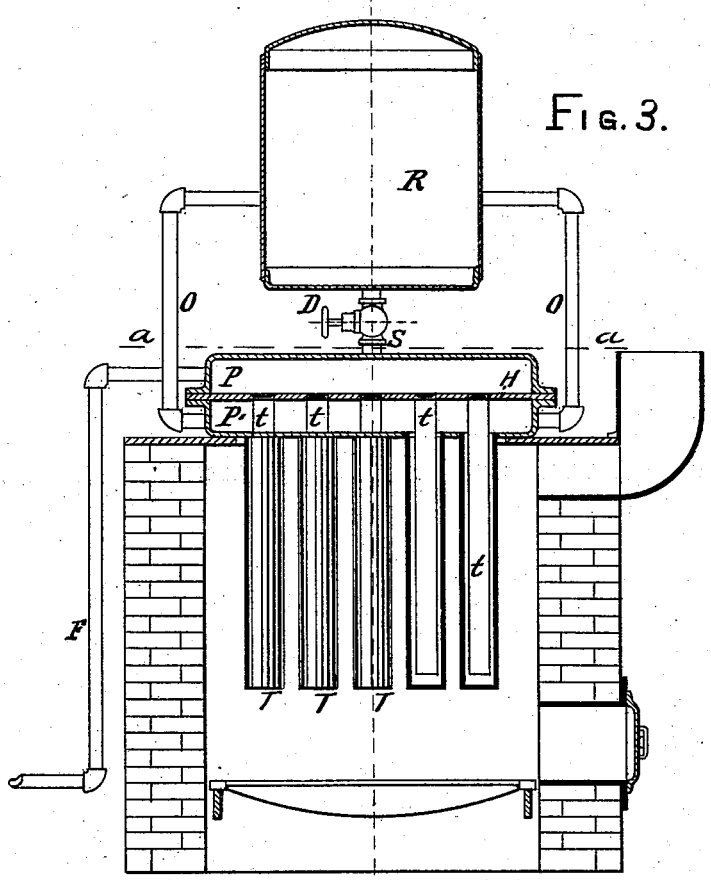
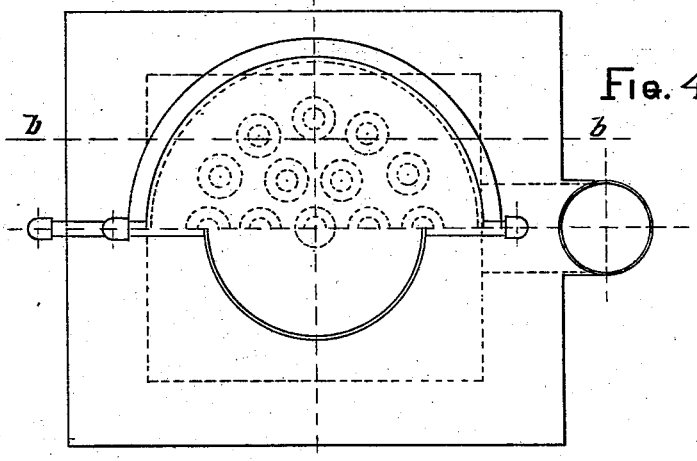


Fig. 4.



WITNESSES

John F. Ish

T. L. Jones

INVENTOR

W. E. Prall

(No Model.) 3 Sheets—Sheet 3.

W. E. PRALL.

HEAT GENERATING APPARATUS.

No. 261,480. Patented July 18, 1882.

Fig. 7.

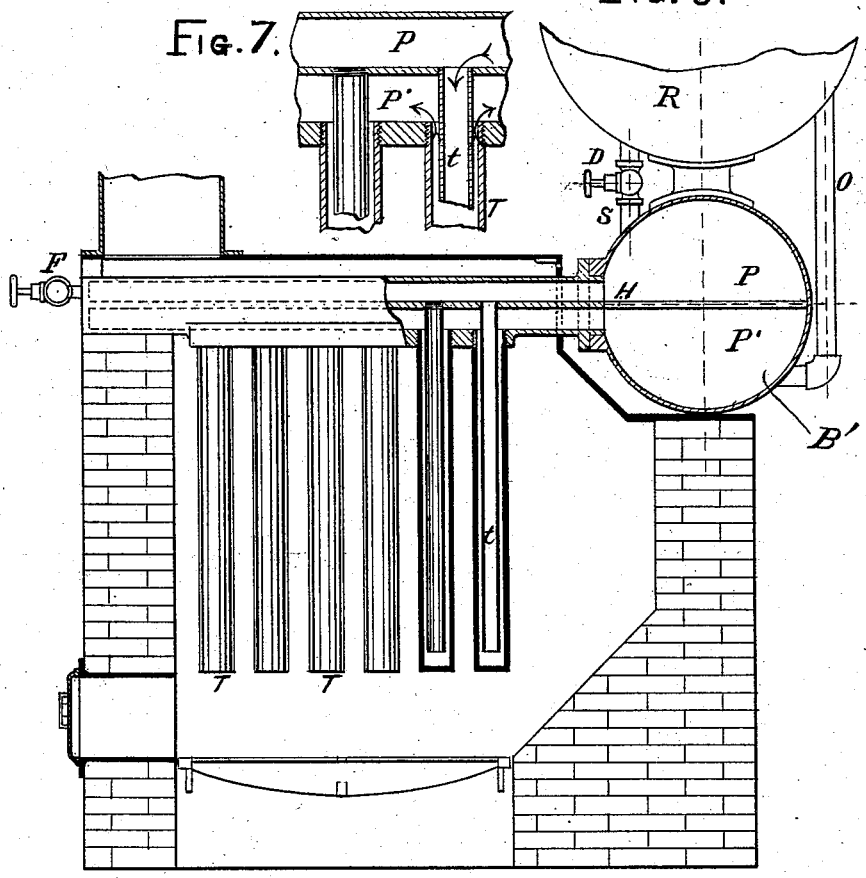
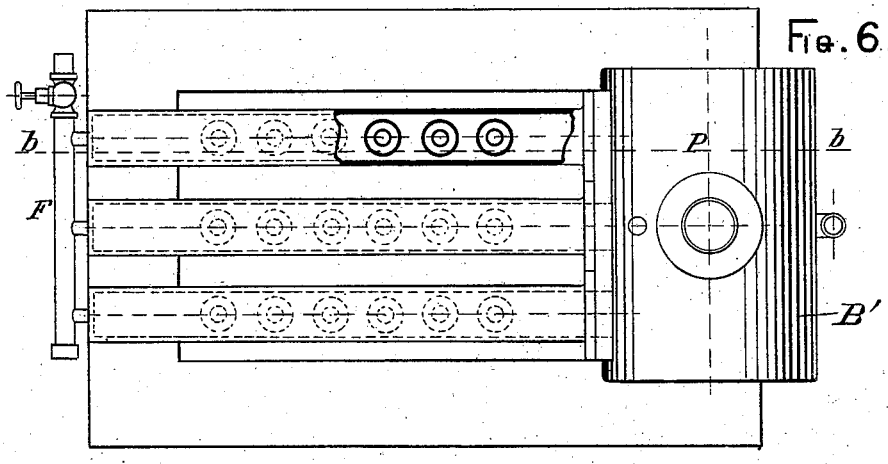


Fig. 5.

Fig. 6.



WITNESSES.

John A. Wise

T. L. Jones

INVENTOR.

W. E. Prall

UNITED STATES PATENT OFFICE.

WILLIAM E. PRALL, OF NEW YORK, N. Y.

HEAT-GENERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 261,480, dated July 18, 1882.

Application filed December 27, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. PRALL, of New York city, in the county and State of New York, have invented certain new and useful Improvements in Heat-Generating Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, illustrating the same, and forming part of this specification.

My invention relates to an apparatus for heating, or rather superheating, water, for use in connection with my systems of supplying heat by means of superheated water, for application in heating buildings, cooking, and manufacturing purposes.

The improvements consist in a generator composed of a furnace in which a multitubular duplex-tube water-back is arranged, through which the water is circulated, and from which it is conducted to a receiver or tank that is connected with the distributing-mains, all as hereinafter specified and claimed.

In the drawings, in the several figures of which like parts are similarly designated, Figure 1 is a vertical section on the line *b b* of Fig. 2. Fig. 2 is a top plan view and partial section on line *a a*, Fig. 1. Fig. 3 is a vertical section, on line *b b*, Fig. 4, of a modification. Fig. 4 is a top plan view, exposing half each of the receiver and water-back, on line *a a*, Fig. 3, of the same. Fig. 5 is a vertical section, with the water-back partly in elevation, of another form, the section being on line *b b* of Fig. 6. Fig. 6 is a top plan view, partly in section, of the same; and Fig. 7 is a section of a part of the water-back, illustrating the mode of inserting the tubes.

A designates a furnace of any approved construction. The vertical back wall of this furnace may consist of my water-back B. This water-back is made up of metal plates *c d*, shaped to form a chamber, a diaphragm, H, of metal, being arranged between the plates *c d*, so as to divide the water-back into two chambers, P P′. I tap into the diaphragm a number of tubes, *t*, open at both ends and extended horizontally into and toward the front of the furnace. I also tap into the plate *d*, concentrically with the tubes *t*, a corresponding number of tubes, T, slightly larger than and inclosing the tubes *t*. The tubes T are open at their attached ends, but closed at their opposite ends. The tubes *t* open into the chamber P, and also into the tubes T, while the tubes T open into the chamber P′.

It is not new to provide heating apparatus with a water-back divided into two compartments, in the partition between which tubes open at both ends are set, said tubes extending into other encircling tubes opening into the other compartment, but closed at their outer ends.

Arranged in suitable relation to the water-back is a tank, R, connected to the chamber P of the water-back by a pipe, S, in which pipe is a cock, D. The chamber P′ is also connected to this tank by a pipe, O. A pipe, F, connected with a force-pump or other pumping-engine, is also arranged to open into the chamber P.

The generator shown in Figs. 3 and 4 differs from that just described only in the arrangement of the water-back at the top of the furnace, so that its tubes stand vertically. This construction necessitates an obvious rearrangement of the tank and pipes.

In Figs. 5 and 6 the water-back is arranged in a number of separated legs or sections which are made with a diaphragm, and which open into a common receiver, B′, which is divided into chambers P and P′, in connection with the supply and discharge, respectively, of the tank R. In such a construction the pump-pipe F has an independent connection with each of the legs.

In the operation of my invention the tank R is connected with the water-back and the distributing-pipes, which are filled with water. The water being admitted into the water-back through the open cock D in the pipe S, and fire having been started in the furnace, the water will pass into the chamber P, and thence through the pipes *t* out into the pipes T, which being in immediate contact with the fire and exposing a large surface thereto, the water will be highly heated therein, and, returning, will enter the chamber P′, and thence escape into the distributing-tank R. The result of this mode of introducing and heating the water is a circulation thereof through the apparatus and its connections, the heat, as is well

understood, causing the movement of the water. If the cock D is closed, a forced circulation may be obtained by introducing the water through the pipe F. The water of the receiving-tank circulates freely by reason of the difference of temperature of the water in the annular space between the tubes *t* T and the water in the inside of the internal tube, *t;* but if the valve in the pipe S should be closed and the feed-supply pump is furnishing the necessary quantity of water, then the circulation becomes a positive one, and the temperature of the water passing through the receiving-tank can be regulated with the greatest certainty and safety for any needs for which it may be required. Should any mishap cause the feed or supply of water to the boiler to stop, great danger would be likely to ensue if there were no means of starting immediately a circulation. I provide this means in the cock D.

Although I have designed this apparatus for the sole purpose of superheating water for use in connection with my systems of heating, still I do not wish to be understood as limiting my invention to this single purpose. The apparatus is admirably adapted to work under high pressures, and hence is capable of use in making steam.

What I claim is—

1. A furnace, a divided water-back therein, tubes open at both ends and leading from one compartment of such water-back into tubes opening into the other compartment at one end, closed at the other end, and surrounding the other tubes, combined with the water-tank R, connected with said water-back upon opposite sides of its diaphragm, and adapted to operate to insure circulation of heated water throughout the apparatus, substantially as specified.

2. In a water-heater, a multitubular water-back provided with a diaphragm dividing it into chambers, whereby the heating-tubes are separated from the supply-tubes and circulation is induced from the heating-tubes independent in its movement of the water supplied to take its place, combined with the receiving-drum R, connected to the water-back on opposite sides of its diaphragm, a water-supply, and a valve or cock connected with said drum and operated to produce either a forced or natural circulation through the apparatus, substantially as specified.

WM. EDGAR PRALL.

Witnesses:
JOHN FISH,
T. L. JONES.