

(No Model.)

S. M. FULTON.
Feed Water Heater.

No. 232,342.

Patented Sept. 21, 1880.

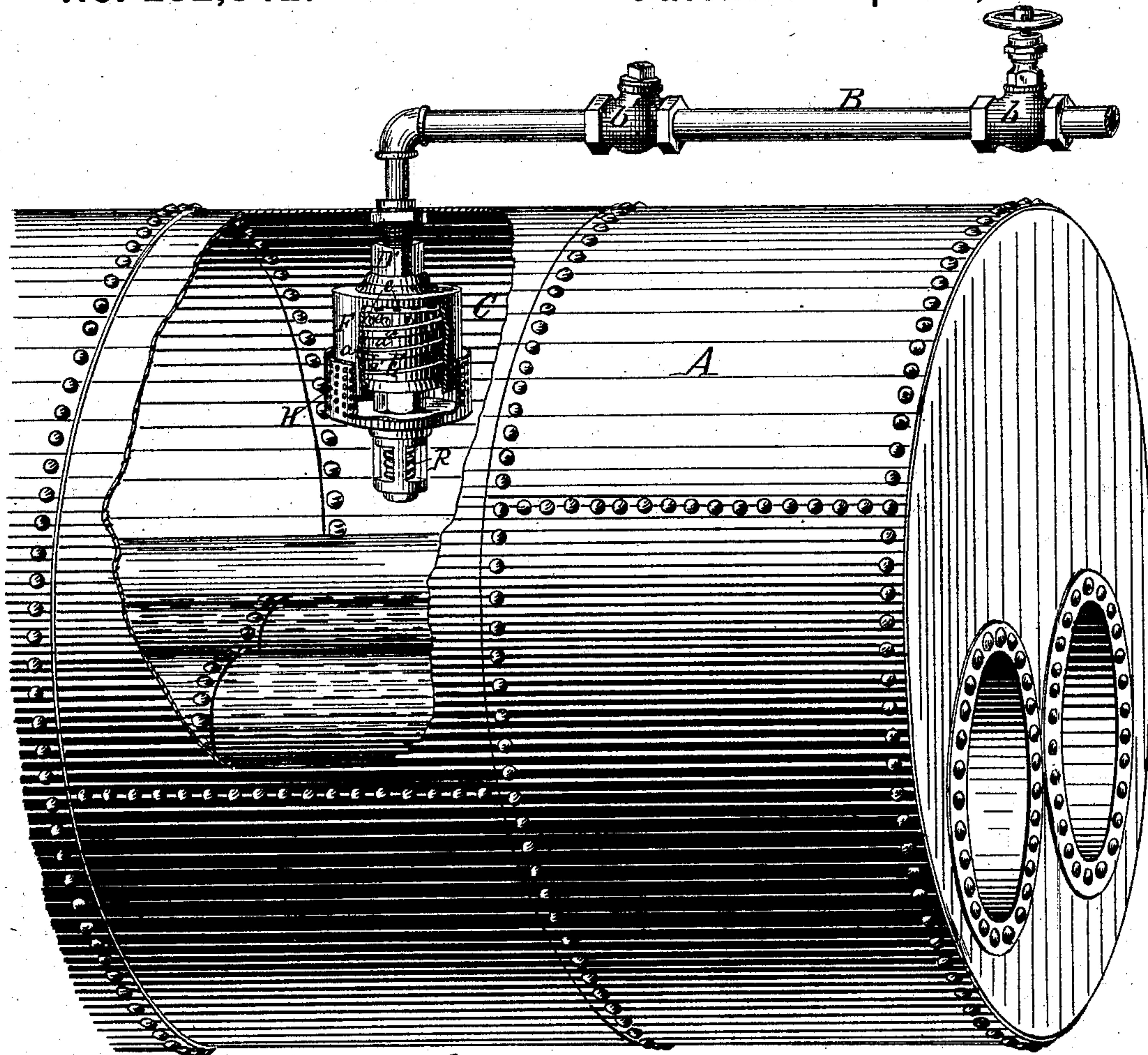


Fig. 1.

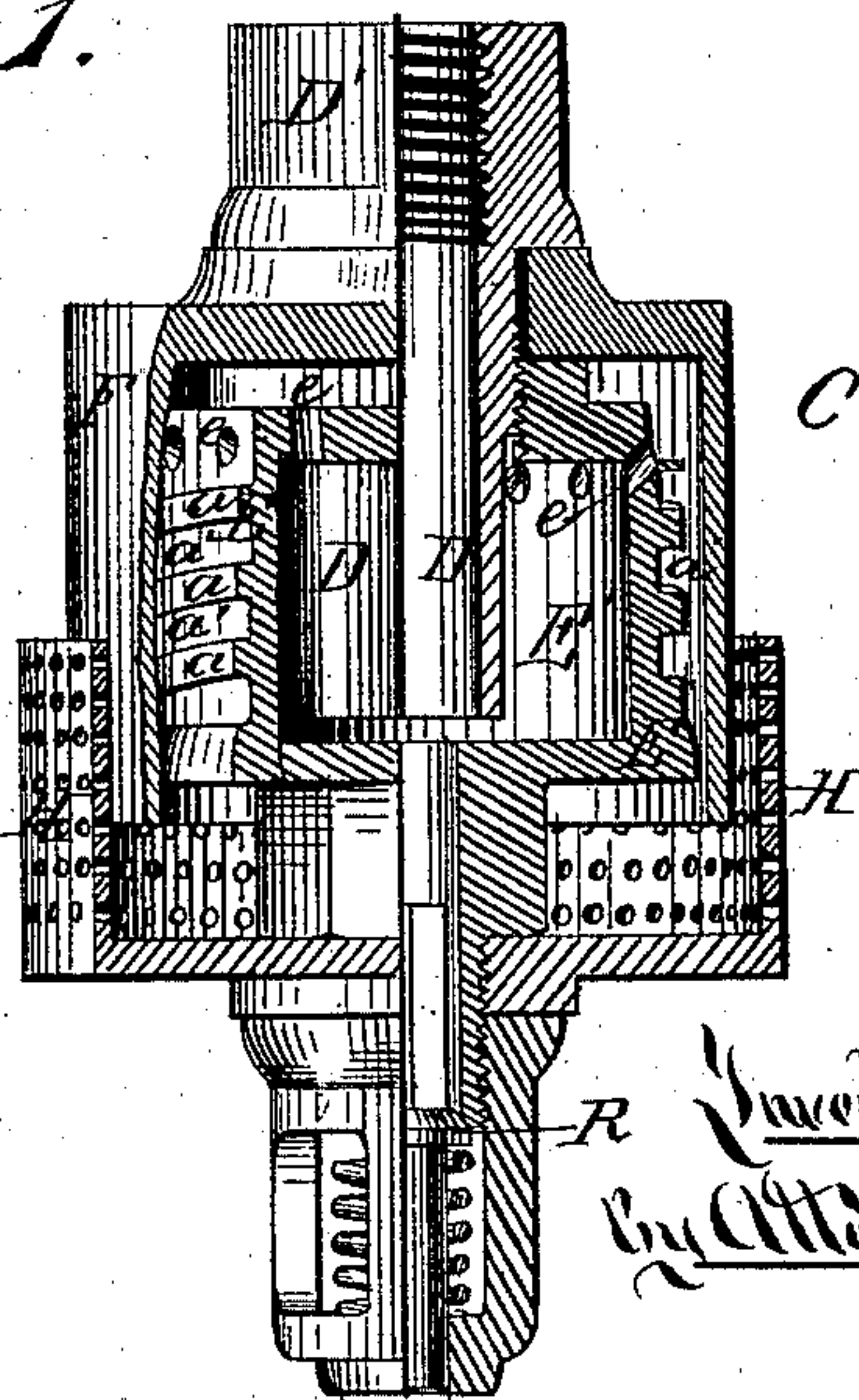


Fig. 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

SAMUEL M. FULTON, OF PITTSBURG, PENNSYLVANIA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 232,342, dated September 21, 1880.

Application filed August 9, 1880. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL M. FULTON, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Feed-Water Heaters; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 shows, in perspective, my improved feed-water heater arranged in a steam-boiler, the side of the boiler and a part of the outer shell of the heater being broken away for the purpose of illustrating the arrangement and construction of the heater; and Fig. 2 is a sectional elevation of the heater drawn to an enlarged scale.

My present invention relates to an improvement in the class of feed-water heaters shown in patents granted to me as follows: January 1, 1878, No. 198,737; April 16, 1878, No. 202,535, and June 3, 1879, No. 216,173.

The object of my invention is to give the water a longer course or passage through the heater, so as to expose it a longer time and in thin sheets or streams to the heating action before it is discharged from the heater. This is secured by giving to the water in its passage through the heating space or chamber a circumferential or spiral motion or direction of flow by means of similarly-arranged divisions or ribs in such chamber, by means of which the water is more or less spread out into thin sheets or streams, and in such condition is given a longer passage within and against the outer cover or shell of the heater, and thereby raised to a high temperature before being discharged into the steam-space of the boiler.

In the drawings, A represents a portion of an ordinary flue-boiler for generating steam. B is a feed-water or supply pipe provided with suitable cocks and check-valves *b b'*. Any suitable or desired means may be employed for forcing water through this pipe to supply the boiler, and if desired traps and separating-drums may be used in connection with this supply-pipe, as described in the patents above referred to. This pipe passes, by means of suitable joints and connections, through the

shell of the boiler, and on its inner threaded end is screwed the heater C. The general form and construction of this heater is similar to that shown in my previous patents, in which a tube, D, extends downward from the coupling-nut D', and discharges through its open end into the bottom of an inflow-chamber, E', which is inclosed by the cylinder E. Escape-passages *e* in any desired number are made at the upper end or edge of this cylinder, through which water passes in jets or small streams to the heating-space inclosed between the cylinder and the outer hood or shell, F, which hood is cup-shaped in form, closed above, and dips its rim or open edge into the perforated discharge-cup H. A relief-valve, R, may also be employed, if desired, as described in Patent No. 216,173, before referred to.

As water escapes from the jet-holes *e* it passes downward between the cylinder E and shell or hood F, and it is in this part of the heater that I apply my improvement. In so doing, ribs, projections, or divisions *a* are arranged spirally or circumferentially around the outer face of cylinder E, or in the space between the cylinder and hood, thereby forming guides, channels, or deflecting-ways *a'*, which tend to give the water motion around or part way around the inner face of the hood as it passes to its discharge. I prefer to arrange these ribs in a continuous spiral, as shown, so that the water may have comparatively an uninterrupted flow around the heating-space; but I do not wish to limit my invention to this particular form, as several independent ribs may be employed, which may extend entirely or part way around, and thereby give the water more or less of a circumferential motion, as described. I also prefer to leave a little space between the ribs *a* and the inner face of the hood or shell, so that part of the water may flow over the ribs, and thereby be spread out into comparatively thin sheets and be heated more highly by its contact with the surface of the hood than would be the case were it to pass out to the discharge in an undivided or uniform body, as heretofore.

By providing the intermediate channels, *a'*, between successive ribs, a larger amount of water can pass through the heater in a given time, and also such water is kept against or

in contact with the hood or shell even when feeding slowly, and thereby the feed-water becomes heated to or nearly to the temperature of the water in the boiler before it escapes
5 from the heater.

The advantages secured by thus heating the feed-water to the highest possible degree are well known and are very important; and I have found by actual and extensive use that
10 a heater of the class referred to will, with this improvement, heat the water passing through it to a much higher temperature than without such improvement.

By the term "class," as herein used, I mean
15 and include heaters in which the water in the heater passes to its discharge through an annular heating space or chamber within and inclosed by the outer shell, so as to be heated by its contact with such shell.

20 I claim herein as my invention—

1. In a feed-water heater having therein an annular water-passage or heating-chamber between its inflow-chamber and its outer case or shell, and in combination therewith, one or
25 more ribs or divisions, *a*, arranged in a spiral or circumferential direction around or part

way around such heating chamber or passage, substantially as and for the purposes set forth.

2. In a feed-water heater, the combination of interior inflow-chamber, *E'*, having escape
30 port or ports *e* at its upper edge, an outer shell or hood, *F*, open at its lower edge, and one or more ribs, *a*, arranged in a spiral or circumferential direction around or part way
35 around the space between the hood and inflow-chamber, substantially as set forth.

3. In combination with hood or shell *F* and inclosed cylinder *E*, forming a heating-chamber, with inlet at the top and outlet at the bot-
40 tom, as described, one or more ribs, *a*, arranged spirally around such heating-chamber, with channels or passages *a'* between successive ribs, said ribs projecting from the outer face of cylinder *E* toward but terminating short of
45 or within the inner face of the hood or shell, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand.

SAMUEL M. FULTON.

Witnesses:

R. H. WHITTLESEY,
C. L. PARKER.