A. W. CRAM.

Sectional Boiler.

No. 210,013. Patented Nov. 19, 1878.

Fig. 1.

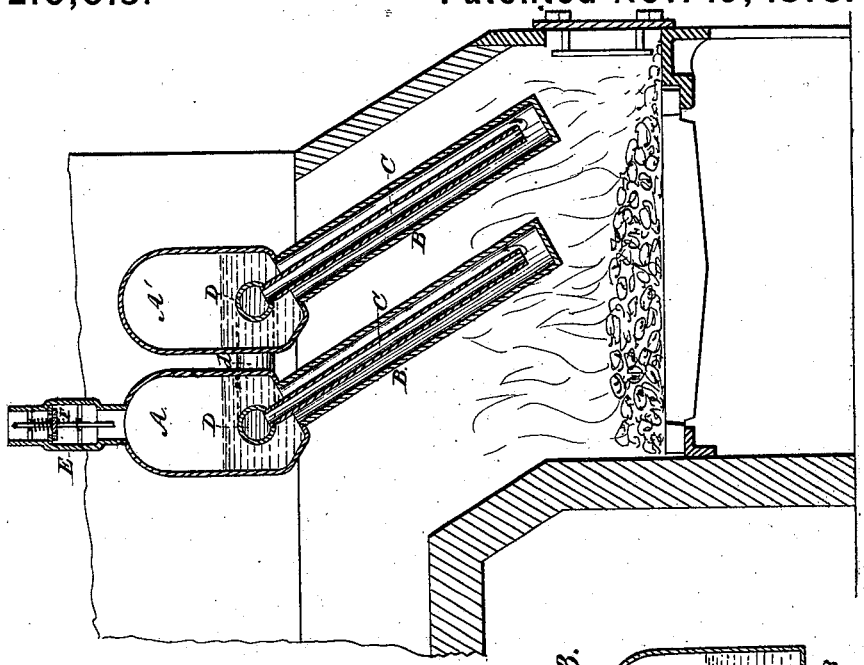


Fig. 2.

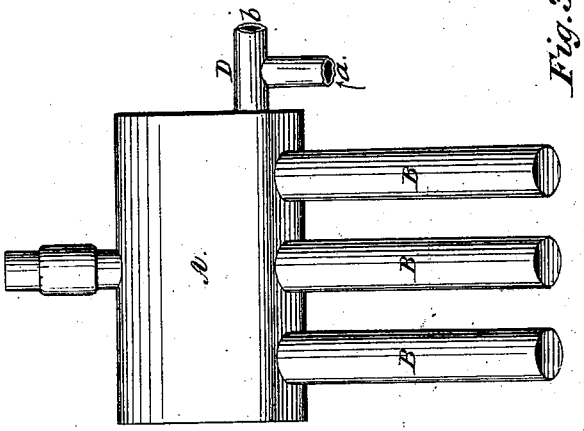


Fig. 3.

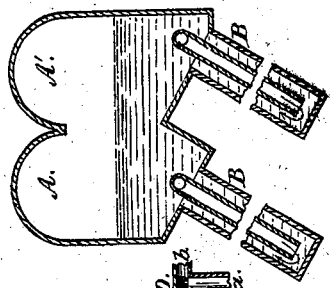
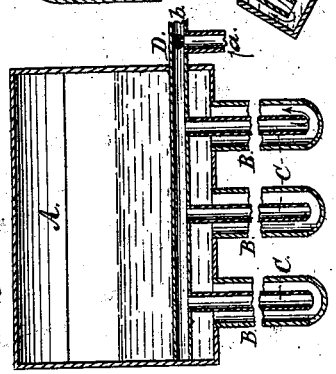


Fig. 4.



Witnesses:

Milton Chase

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UNITED STATES PATENT OFFICE.

ALONZO W. CRAM, OF HAVERHILL, MASSACHUSETTS.

IMPROVEMENT IN SECTIONAL BOILERS.

Specification forming part of Letters Patent No. **210,013,** dated November 19, 1878; application filed September 14, 1878.

To all whom it may concern:

Be it known that I, ALONZO W. CRAM, of Haverhill, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Feed-Water Heater and Boiler; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which form a part of this specification.

The object of my invention is to produce a boiler and feed-water heater combined, which is reliable, economical, and efficient in its operation, and that can be adapted to suit different kinds of work by adding additional sections to it, and that is not liable to explode.

The invention consists of two or more sections or shells of peculiar shape, having inclined bottoms, to which are secured, in any suitable manner, inclined tubes, closed at their outer ends with internal tubes of smaller diameter with open ends, and which are connected to a cross-pipe, that passes to the outside of the shell and connects with the feed pump or apparatus, and having a branch pipe to connect with a blow-off valve. The tubes are secured to the sections either by tapping, bolting, or in any other suitable manner, and they extend down quite close to the fire. By arranging the tubes in an inclined manner, the steam generated in the outer ones rises to the upper side thereof and passes into the sections or shell, while the feed-water coming through the inner tubes passes up the external ones, becomes highly heated before it reaches the bottoms of said external tubes, and at the same time creates a constant circulation of water.

The invention also consists in the use of the same pipes and tubes for supplying the feed-water to the boiler and heating it, as also for blowing out the water and sediment, by merely connecting the ends with a T-piece, one end of which connects to the feed pump or apparatus and the other end with a blow-off valve.

The boiler-sections may be in separate pieces and connected by suitable pipes; or they may be made in one piece, merely retaining the inclined or corrugated bottoms.

In the accompanying drawing, Figure 1 is a vertical section of the boiler with the heating-tubes arranged in position. Fig. 2 is a side view of one of the sections. Figs. 3 and 4 are sections of a modification of the boiler-shell in one piece, with the heating-tubes attached.

In the drawing, A represents the shell or sections, having its lower sides or bottoms inclined and its upper sides arched. To the lower sides are attached in any suitable manner the external tubes, B, having their lower ends closed and inclining at an angle of about sixty degrees, more or less, and extending down close to the fire. In these tubes B are arranged the open-ended internal tubes, C, attached to the cross-pipes D, which protrude through the shell, and are connected by a horizontal pipe, *d*, to the adjoining section.

The outer end of the cross-pipe D is provided with a T or branch pipe, one end, *a*, of which communicates with the feed pump or apparatus, and is provided with a suitable stop-valve, and the other end, *b*, is provided with a blow-off valve. A check or priming valve, E, may be used, if desired.

In the modification, Figs. 3 and 4, the shell A is made in one piece, but the general configuration is retained, and the inclined tubes are secured to the inclined bottoms in the same way as in Fig. 1.

The operation is as follows: The shell or sections A A′ are filled by the feed-water, which passes through the pipe D down the internal tubes, C, and rises in the external tubes, B, to the proper level in the shell. The fires are then started, and feed-water in passing down and up the internal and external tubes becomes highly heated, and the steam generated in the external tubes rises to their upper sides and passes into the shell A A′.

In case of priming or the sudden withdrawing of steam through the steam-pipe, the valve F closes and compels the water to remain or fall back into the boiler. The steam, being more elastic, can pass through the grooves or slots and perforations in the valve and seat.

When it is desired to blow out the boiler, the stop-valve in the feed-pipe is closed and the blow-off valve opened, when the steam in the boiler will blow all the water and sediment down the external tubes, B, up the internal

tubes, C, and out through the cross-pipes D and blow-off valve.

The advantages of my boiler and feed-water heater are, that it is entirely reliable and effective; the steam is generated very quickly; a constant circulation of feed-water is kept up and is heated; it can be readily increased in size by adding additional sections to it; it can be very easily repaired in case of any of its parts becoming worn out; no additional pipes or tubes are needed for blowing out the water and sediment, as the feed-pipes are interchangeable with the blowing-off pipes; no water can be carried to the cylinders by priming or the sudden withdrawal of steam from any cause; it can be furnished at a verys mall cost, can be made of any material desired; and it can be transported in smaller sections than the ordinary boiler.

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

1. A boiler and feed-water heater combined, consisting of one or more sections, A, with inclined external drop-tubes, B, and inclined internal drop-tubes, C, connected to cross-pipes D, substantially as shown and described.

2. The boiler herein described, consisting of two or more sections, A A′, having inclined bottoms, to which are secured external inclined drop-tubes, B, with internal inclined drop-tubes, C, connected to cross-pipes D, that are provided with T or branch pipes *a b*, constructed and arranged substantially as and for the purpose set forth.

3. The combination herein described of the external inclined drop-tubes, B, and internal tubes, C, with cross-pipes D, arranged for interchangeably feeding and blowing out the boiler, as shown and specified.

In testimony that I claim the foregoing as my own I hereby affix my signature in presence of two witnesses.

ALONZO W. CRAM.

Witnesses:
MILTON CHASE,
A. F. CRAM.