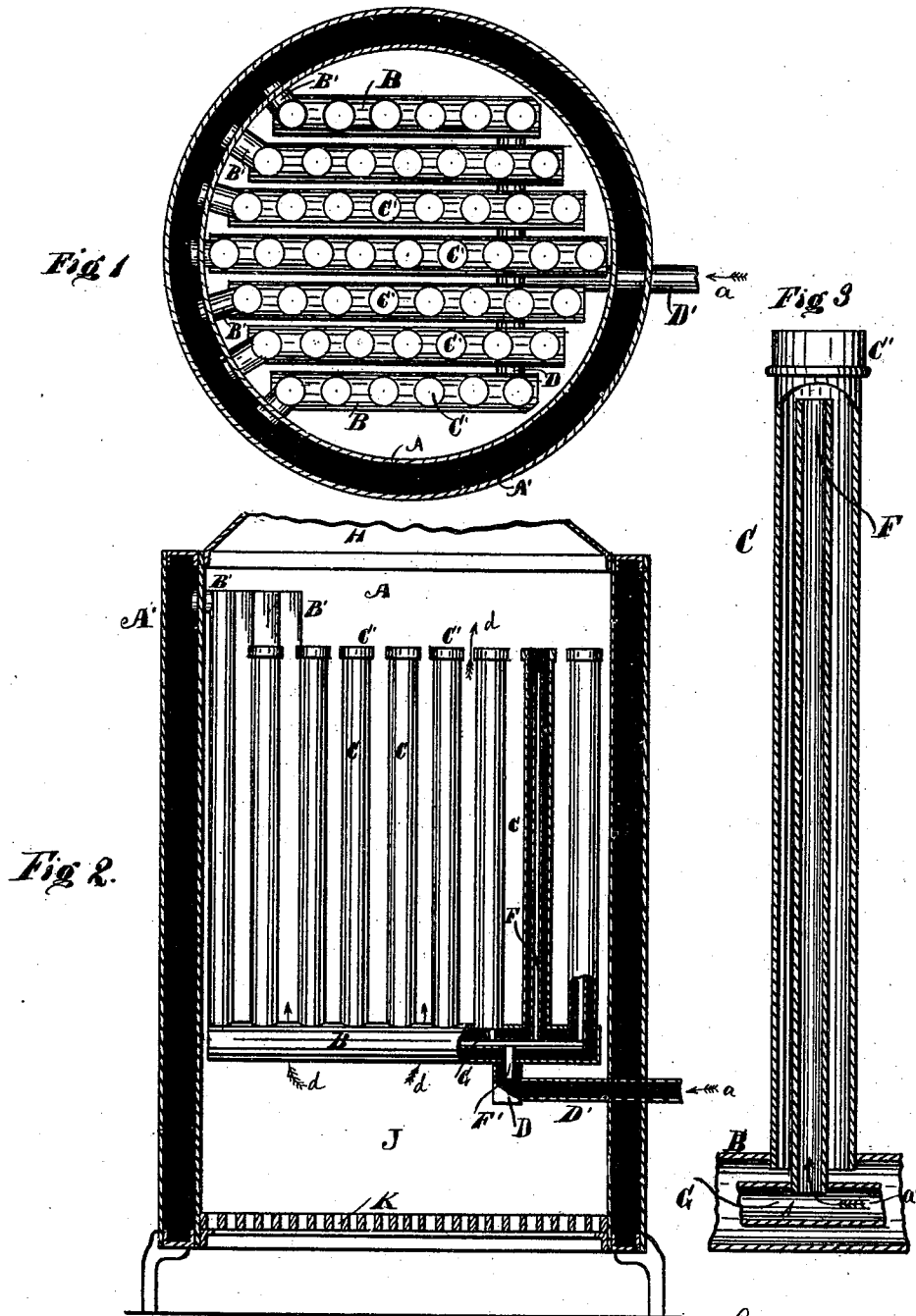


G. S. FAULKNER.

CIRCULATING TUBULAR BOILER.

No. 178,517.

Patented June 13, 1876.



Witnesses;
E. C. Whitney
H. C. Carter

Inventor;
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UNITED STATES PATENT OFFICE.

GEORGE S. FAULKNER, OF INDIANAPOLIS, INDIANA.

IMPROVEMENT IN CIRCULATING TUBULAR BOILERS.

Specification forming part of Letters Patent No. 178,517, dated June 13, 1876; application filed April 24, 1876.

To all whom it may concern:

Be it known that I, GEORGE S. FAULKNER, of Indianapolis, Marion county, Indiana, have invented a new and useful Improvement in Boilers for Steam Fire-Engines, of which the following is a description, reference being had to the accompanying drawing.

My invention relates to the construction of a steam boiler or generator, in which a small quantity of water is injected constantly into a small pipe inclosed in larger pipes surrounded by fire, whereby the water is generated into steam rapidly in any desired quantities required; and my invention consists of inclosing the feed-water pipe entirely in larger pipes, and arranging these pipes thus combined in sections inside of the boiler-shell. Each section of these inclosed pipes is connected together at the bottom by cross-pipe of sufficient size to receive water in the desired quantities to feed all the sections, and the last upright pipe in each section is connected with the steam-space of the boiler, so that all steam generated in the sections of pipes arranged in the fire-box is conducted into the steam-space of the boiler for rapid use.

I am aware that previous to my invention there have been constructed "instantaneous generators," or a form of steam-boiler similar in some respects to my invention. These instantaneous generators differ from ordinary boilers, and also from my invention, in construction and mode of operation. In the first place, they differ from the ordinary steam-boiler because there is no unvaporized water in the boiler, and in most cases where these instantaneous generators are used there is no steam-chest employed, and the object sought for has been to inject at times a sufficient quantity of steam for one impulse of the piston, which was accomplished by flashing a jet of water instantly into steam. In order to accomplish these results the steam-generator is formed similar in some respects to my invention. I have referred to the patent of Dr. Alban, of Mecklenburg, patented in 1825, in which the steam was generated in a series of strong vertical tubes, which were submerged in a bath of molten lead. The row of vertical tubes or pipes was attached to a cross-pipe, and above and outside of this cross-pipe

was located the water-supply pipe, by means of which the water was supplied to the inside vertical pipes located inside of the other pipes, either heated by the bath of lead or by fire, and the water thus injected was instantly flashed into steam for the purpose required; and such an arrangement of parts and such results produced I do not claim, as they are old.

In the drawing, Figure 1 represents a cross-section of a steam fire-engine boiler, taken near the top, embodying my improvement. Fig. 2 is a vertical section of the same. Fig. 3 represents an enlarged sectional view of the arrangement of pipes as used in the apparatus.

A represents the inner annular shell of the boiler. A' represents the outside annular shell, and between these two shells there is an annular water and steam space. At the bottom of the boiler is arranged a set of grate-bars, K, and at the top of the boiler is the smoke-stack H, all arranged substantially as shown and described. On the inside of the boiler, above the fire-chamber J, are arranged a series of rows of vertical tubes or pipes, C, which are inserted at the bottom in the connecting-pipe B. The upper ends of each of these vertical tubes are provided with a cap, C', which closes the ends of the tubes C completely. All of these tubes C are thus capped, except the last one in each row, which is made longer than the rest, and is connected at the top B' to the steam-space, between the two shells A A' of the boiler, as shown. On the inside of the lower connecting-pipe B of each section is arranged the water-conducting pipe G, which has also branch tubes F, which extend up inside of the outer vertical tubes C, as shown in Figs. 2 and 3, and to each pipe G, in each section B, there is inserted a pipe, F, which extends downward into a cross supply-pipe, D. This supply-pipe D makes connection with each inside water-pipe G and vertical tubes F inside of the tubes B C, as shown in Figs. 1 and 2, and the pipe D is of sufficient capacity to convey the proper supply of water from the pump, by means of the pipe D', to each set of vertical pipes F, in the manner shown. Here it will be seen that the water is forced into pipe D' in the direction of the arrow a, and fills the cross-pipe D under the row

of vertical tubes. The water is then forced into each pipe G of each section by means of the pipe F', and is then conveyed up the vertical pipes F, where it is allowed to become vaporized in its passage out of the tubes F and down the outer tubes C, and the lower connecting-pipe B conveys the steam thus generated into the steam-space between the shells A A' of the boiler by means of the last tube B' of each row of vertical tubes, as shown. The lower part of the space inclosed between the shells A A' is occupied with water above the point where the fire in the fire-box would be liable to burn the inner shell, and is to be always kept in this condition, and water is supplied to this space by means of the pump, and is there heated, and is then taken from the space between the shells, and forced into the series of rows of vertical tubes, in the manner described; or cold water may be introduced into the vertical tubes, and into the annular space between the shells, if so required.

The fire in the fire-box J has a free circulation upward, and envelops all the outer tubes B C in flame, and consequently the water-tubes become intensely heated; and as the small streams of water that are constantly pouring out of the upper ends of the inner vertical tubes F come in contact with these heated surfaces, the water is vaporized, and the outside pipes are only conveying the vapor thus generated to the steam-space of the

boiler, and the pipes or tubes B C are prevented from being burned by the rapid circulation of the steam and water which is passing through them.

I do not broadly claim the outside vertical tubes C and inner vertical tubes F, as they are old; but

What I claim as new, and wish to secure by Letters Patent, is—

1. In boilers, the combination of the connecting-pipe B, vertical outside pipes C, caps C', arranged in rows, and united together by means of the lower cross-pipe D, and each row of pipes C connected by the extended pipe B' to the steam-space between the shells A A', in the manner shown, for the purposes set forth and described.

2. In boilers, the water-pipes G, inclosed in the outer pipes or tubes B, and provided with vertical water-tubes F, extending up inside of the outside vertical tubes C, the main supply-pipes F' connecting the pipes G with the main supply-pipe D, in the manner shown, for the purposes set forth and described.

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

GEORGE S. FAULKNER.

Witnesses:

E. O. FRINK,

H. W. COOK.