J. H. Boardman;

Steam-Boiler Fire-Tube.

No. 29,355. Patented July 31, 1860.

Fig 2.

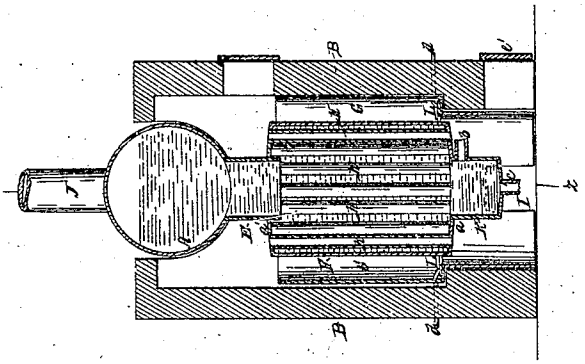


Fig 3.

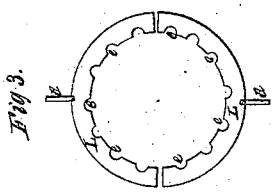
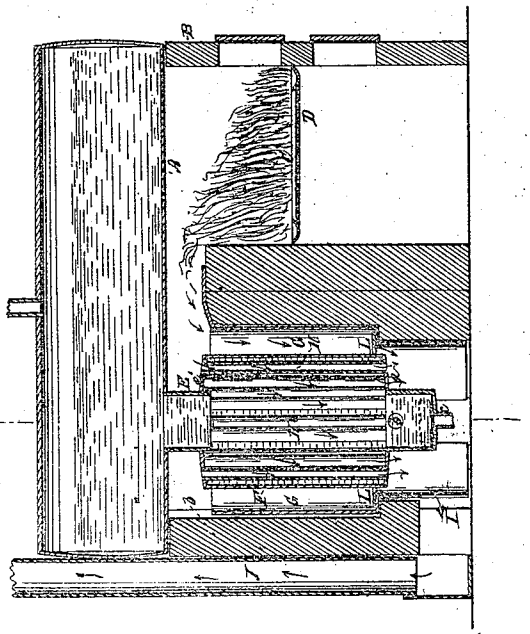


Fig 1.



Witnesses.

Inventor.

J. H. Boardman

THE ECKERT LITHOGRAPHING CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

J. H. BOARDMAN, OF NEW YORK, N. Y.

STEAM-BOILER.

Specification of Letters Patent No. 29,355, dated July 31, 1860.

To all whom it may concern:

Be it known that I, J. H. BOARDMAN, of the city, county, and State of New York, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification, in which—

Figure 1 represents a longitudinal vertical section of my invention, the line *x*, *x*, Fig. 2, indicating the plane of section. Fig. 2 is a transverse vertical section of ditto taken in the plane indicated by the line *y*, *y*, Fig. 1. Fig. 3 is a detached plan of my draft regulator and flue cleaner.

Similar letters of reference in the three views indicate corresponding parts.

This invention consists first in the arrangement of a central neck connecting a horizontal plain, cylinder boiler and a vertical tubular boiler in combination with a flue, surrounding said vertical boiler in such a manner that the vertical cylinder shall be suspended when set and the heat from the furnace passes under the horizontal boiler, which forms the top or covering of the furnace, thence down through and around the vertical boiler, whereby a large amount of heating surface is obtained at a small expense; second in the combination with the vertical tubular boiler of a mud box in such a manner that the impurities which precipitate from the water collect in said mud box from whence they can be easily removed by blowing out the water.

To enable those skilled in the art to make and use my invention I will proceed to describe its construction and operation with reference to the drawing.

A, represents a plain cylinder boiler which forms the covering of the furnace and is supported by the brick work B, and which is heated by a fire in the furnace C. The grate D consists of a series of semi-circular troughs, arranged in such a manner, that they can be filled with oil, if it is desired to use such as fuel instead of coal.

The boiler A, connects by means of a round cylindrical neck E, with a vertical cylindrical boiler F, which passes down through the flue G. Heating tubes H, run in a vertical direction through the boiler F, and the flame or heat from the fire passes down through these tubes, and around the vertical boiler F, to the bottom flue I, and through this flue to the smoke stack J, as clearly indicated by the arrows in Fig. 1. It will be noticed that the heating tubes H, are arranged all around the connecting tube or neck E, so that an equal amount of heat, passes through every part of the vertical boiler, and at the same time by means of the drop flue G, the outer surface of said vertical boiler is rendered available as heating surface, which gives me the great advantages of producing with little material a very large amount of heating surface.

The vertical boiler F, is arranged with a mud box K, in the center of the lower tube sheet *a*, and the feed water is conducted to this boiler through a pipe *b*, in the side of the mud box. A pipe *c*, passing from the bottom of said box serves to blow off the contents of the boiler. The mud box receives all the sediment which precipitates from the water in the boiler and which would otherwise settle in among the tubes H. Hand holes may be made in said mud box and in the lower part of the tubular cylinder. The annular flue G, is made sufficiently large for flame to live in except at the bottom and near to the lower edge of the boiler F, when it is contracted as clearly shown in Figs. 1 and 2, in the drawing. By this arrangement the flame from the fire is allowed to pass down into the flue G, as well as into the tubes H, and the outside surface of said vertical boiler is rendered available as fire surface as well as the surface of the heating tubes themselves. Without contracting the flue G, at the bottom and if it had the same width all the way down, which it has on the top, the draft would be completely diverted from the heating tubes H, and the actual heating surface of the boiler would thereby be materially reduced; and if said flue would be continued all the way up of the same width, which it has on the bottom the flame from the furnace could not pass down through the same and the effect of the outer surface of the boiler as actual heating surface would be materially reduced. The contraction of the flue G, at the bottom ought to be such that the draft passing through said flue is in the same proportion to the outer surface of the vertical boiler in which the draft passing through the heating tubes is to the outer surface of said heating tubes.

In order to facilitate the adjustment of the draft to the proper proportion as above

indicated, I have placed in the bottom of the flue G, two semi-circular plates L, which are operated from the outside of the brick wall by means of handles or rods *d*. The edges of these plates are scalloped as clearly shown in Fig. 3, and they embrace the vertical boiler F, so that by drawing out or pushing in said plates the lower end of the flue G, can be enlarged to free it from ashes or cinders and then contracted as occasion may require. By cutting into the edges of said plates a series of half circular notches *e*, (see Fig. 3) equal in area to the area of the cross-sections of the heating tubes H.

The proper regulation of the draft is greatly facilitated, and by making the plates movable, they can be easily freed from any substance that would clog them. The tube sheets *a a'*, of the vertical boiler F, are slightly bowed out, not enough however to interfere with the vertical position of the heating tubes H. The object of this arrangement is to obtain a more free passage of the steam and water up into the horizontal boiler A, and also to facilitate the passage of the sediment down into the mud box K. The bowing up of the upper and the bowing down of the lower tube sheet renders it necessary to make the heating tubes of slightly increased length as they approach the center, but they can be fastened in a vertical position in the slightly arched tube sheets with equal facility as they can in flat tube sheets.

The vertical cylinder boiler F, is suspended from the cylindrical neck E, without any other support so that the fire can play freely all around the outer surface of said boiler, and that the entire surface of the same is rendered available as heating surface. At the same time free access can thus be had to the whole under surface of the boiler F, whereby the clearing of the same is greatly facilitated. A door *e'*, in the brick work B, gives access to the bottom flue I, and to the lower surface of the boiler F. Furthermore, by leaving said boiler without support at its bottom, it is left free to expand or to contract and there is no danger that the joints connecting the two boilers will become loose from this cause or that by the expansion of the vertical boiler the position of the horizontal boiler is disturbed.

The large amount of heating surface which I obtain by the arrangement of the flue G, heating tubes H, and the vertical boiler F, with a comparatively small expenditure of material enables me to build my boiler cheaper than a plain cylinder or flue boiler with the same heating surface and my boiler is also very economical in its use as it requires but little fuel in proportion to the steam which it produces, and is much more safe than common horizontal and upright tubular boilers on account of its carrying a very large quantity of water on the tubing, and it requires no more room or space than ordinary tubular boilers. It is also more safe on account of the sparks and cinders being unable to rise from the bottom of the chimney flue I, when they are carried by the draft and their own gravitation. By introducing atmospheric air into the upper part of the furnace and into the drop flue G, the smoke and combustible gases are consumed much more effectually than in common boilers.

Having thus fully described my invention what I claim as new and desire to secure by Letters Patent, is;

1. The arrangement and combination of the circular central neck E, horizontal boiler A, vertical tubular boiler F, and surrounding drop flue G, operating substantially as and for the purpose set forth.

2. The combination with the vertical tubular boiler F, of a mud box K, constructed and operating substantially in the manner and for the purpose specified.

J. H. BOARDMAN.

Witnesses:
M. M. Livingston,
Jno. H. Scott.