

UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN SETTING STEAM-BOILERS.

Specification forming part of Letters Patent No. **50,221**, dated October 3, 1865; antedated September 18, 1865.

To all whom it may concern:

Be it known that I, JOHN CHILCOTT, of No. 70 Fulton street, in the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Setting 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 drawings, forming part of this specification, in which—

Figure 1 is a transverse vertical section of a tubular boiler and its setting with my improvements. Fig. 2 is a longitudinal vertical section of the same in the plane indicated in the line *x x* in Fig. 1. Fig. 3 is a longitudinal vertical section in the plane indicated by the line *y y* in Fig. 1. Fig. 4 is a horizontal section of the same in the plane indicated by the line *z z* in Figs. 1, 2, and 3. Fig. 5 is a plan of the same with the top of the setting removed.

Similar letters of reference indicate corresponding parts in the several figures.

The object of this invention is to economize fuel.

One feature of the invention consists in a novel arrangement of tubular water and steam spaces, partitions, and flues, whereby I provide for a horizontal and vertical circulation of the gaseous products of combustion between the tubes.

Another feature of the invention consists in providing within the sides, back, and top of the outside setting of a boiler a continuous system of flues, through which the gaseous products of combustion will circulate many times back and forth around and over the boiler before escaping to the smoke-stack.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A A' A² A³ are the tubes which constitute the water and steam spaces of the boiler, arranged in any number of horizontal tiers, one tier above another. Two tiers only are represented. These tubes are to be connected either inside or outside of the setting *B*, which incloses the several tiers of tubes and the fire-chamber *C*, which is below them. The several tiers are arranged at such distances from each other as to provide for the formation of flues *D D'* between them; but the tubes in each tier are arranged so close together as to prevent

the gaseous products of combustion from passing between them in any quantity.

E is a central vertical partition, of iron or fire-brick, parallel with the tubes, and extending from the lower tier up to the top of the setting, dividing the space between each two tiers of tubes into two flues.

F F' are vertical partitions parallel with the partition *E* in the space between the highest tier of tubes and the top of the setting. The three partitions *E F F'* divide the space last mentioned into four flues, *G G' G² G³*.

To provide for the circulation of the gases through the several flues, the tubes *A* are made shorter than *A'*, and one of the tubes *A²* shorter than the other and than *A³*, thus leaving vertical openings *a* and *a²* at the rear ends of *A* and *A²*, and openings *a' a³ a⁴ a⁵* are made at the front and rear of the partition *E* and at the front ends of the partitions *F F'*. The gaseous products of combustion pass from the rear of the fire-chamber vertically through the opening *a*; thence horizontally forward through the flue *D*, between the tubes *A* of the lower tier and those *A³* of the upper one, thence laterally through the opening *a'* in the partition *E*; thence horizontally backward through the flue *D'*, between the tubes *A'* of the lower tier and *A²* of the upper tier; thence vertically through the opening *a²*, and thence forward and backward alternately through the flues *G G' G² G³*, either directly to the smoke-stack or from the flue *G³*, upward through an opening, *b*, Fig. 5, to the system of flues in the setting *B*, as represented.

The setting *B* is made either of cast-iron or brick-work, with its sides, back, and top hollow, and is divided by partitions *c c* in the top and *d d* in the sides and back in such manner as to form a continuous system of flues, *I I*, in the top and *J J* in the sides and back. The gases, after all passing through the opening *a²*, pass successively through the several flues *I I* in the top of the setting, as indicated by arrows in Fig. 5, and thence down through an opening, *d*, into the uppermost flue, *J*, along which they pass first along one side of the setting, then along the back, and afterward along the other side, descending through an opening, *e*, into the next flue *J* below, and so on in opposite directions alternately, as indicated by arrows in Fig. 3, through all the flues *J J* to the bottom

of the setting, escaping from the lowest flue to the smoke-stack K. By this system of flues in the setting all the available heat from the gaseous products of combustion is utilized, and the said products, before escaping to the smoke-stack, have been so far reduced in temperature as to be incapable of contributing further to the heating of the boiler.

To provide for a direct draft from the fire-chamber to the smoke-stack K, when desired, there is an opening, *f*, Fig. 1, in the lower part of the stack. This opening is to be closed when the gases are required to pass through the flues. To provide for the escape of the gases at the top of the setting without their entering the flues J J, when desired, there is a second smoke-stack, L, which is closed when the products are to pass through J J.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The arrangement of water and steam tubes A A' A² A³, partitions E F F' F² F³, and flues D D' G G' G², substantially as herein specified, whereby a horizontal and vertical circulation of the gases of combustion between the tubes is provided for.

2. Providing in the top, sides, and back of the outside setting of a boiler a continuous system of flues, I I and J J, whereby the gaseous products of combustion are caused to circulate many times back and forth through the setting, substantially as herein described.

JOHN CHILCOTT.

Witnesses:

HIPPOLYTE MALL,
J. W. COOMBS.