

M. MCKAIG & W. J. MUNCASTER.

WATER-TUBE STEAM-BOILER.

No. 174,552.

Patented March 7, 1876.

Fig. 2.

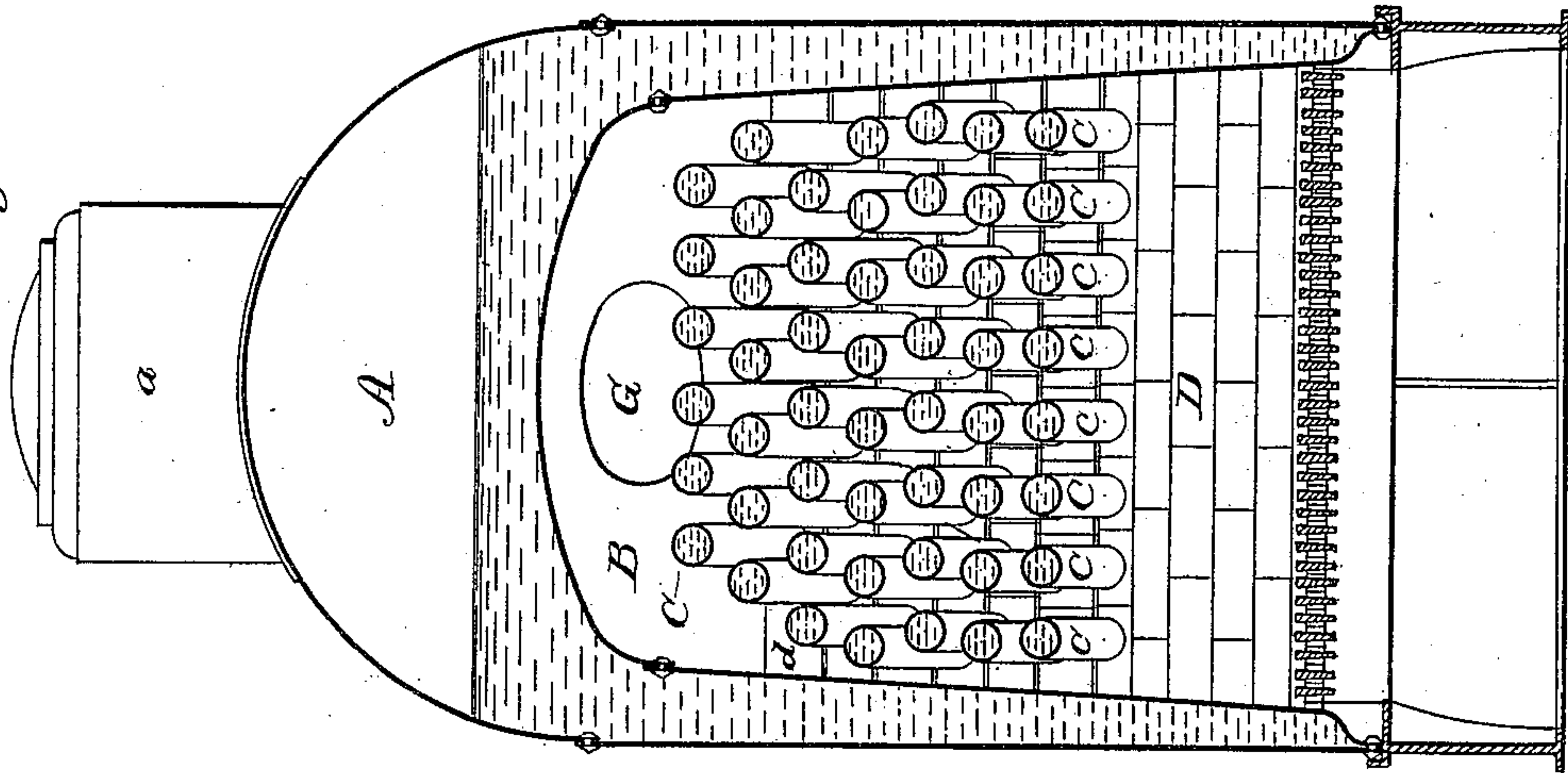
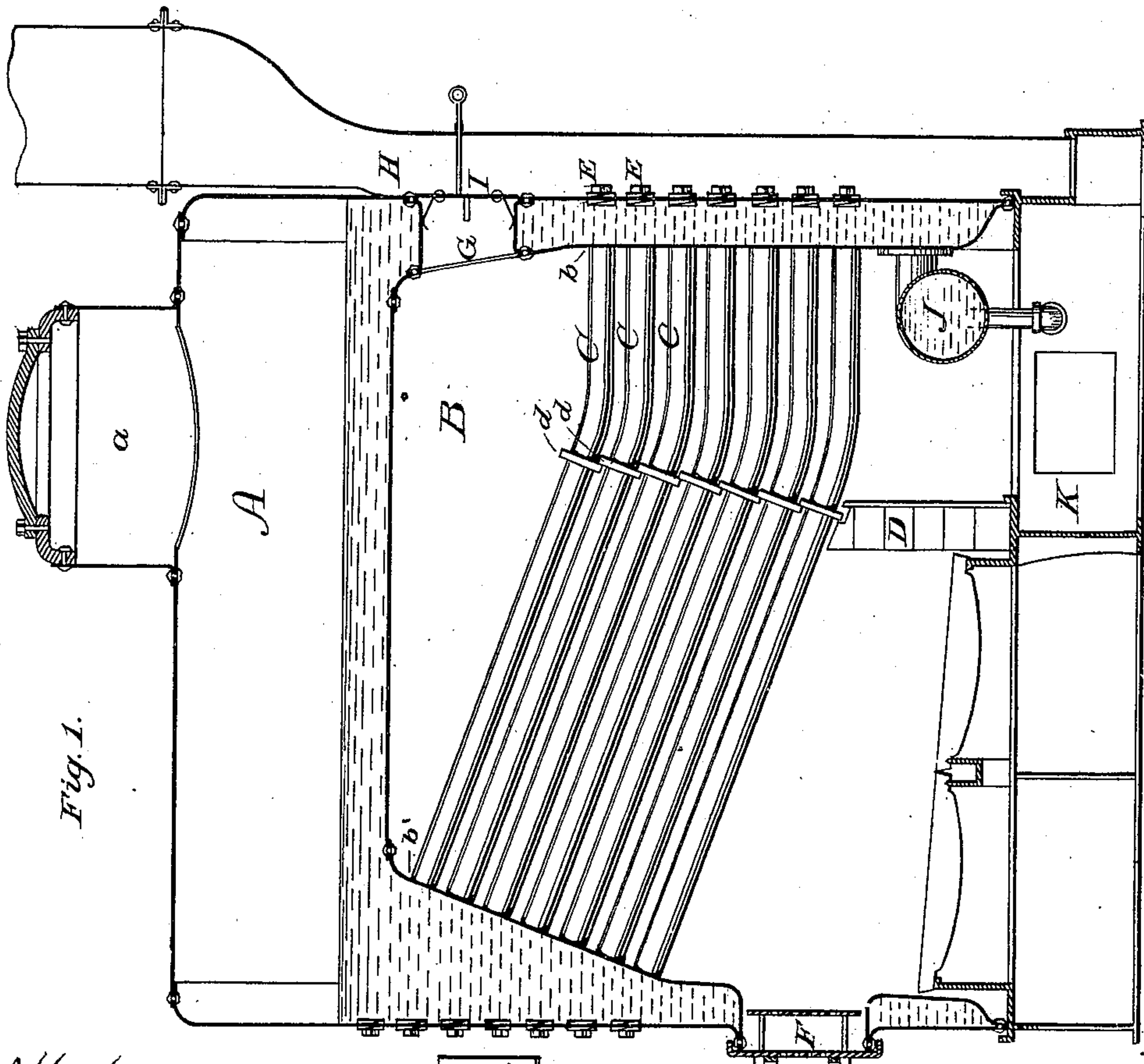


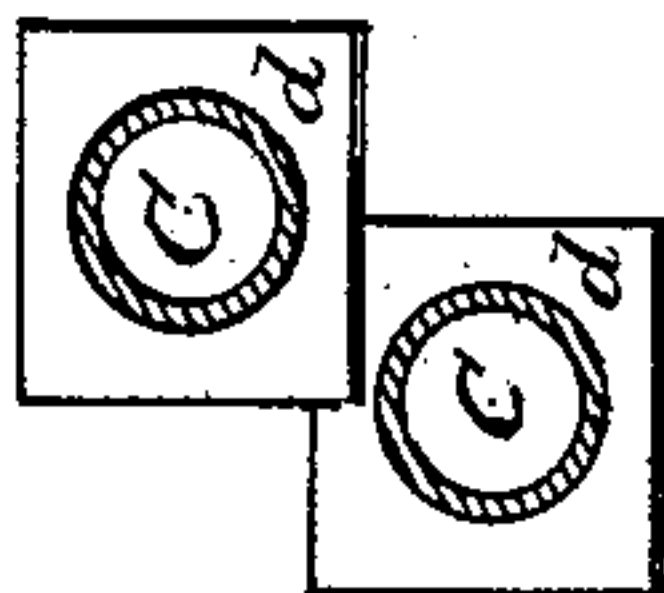
Fig. 1.



Attest:

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Fig. 3.



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MERWIN MCKAIG AND WALTER J. MUNCASTER, OF CUMBERLAND, MD.

IMPROVEMENT IN WATER-TUBE STEAM-BOILERS.

Specification forming part of Letters Patent No. **174,552**, dated March 7, 1876; application filed January 20, 1876.

To all whom it may concern:

Be it known that we, MERWIN MCKAIG and WALTER J. MUNCASTER, of Cumberland, in the county of Alleghany and State of Maryland, have invented certain new and valuable Improvements in Steam-Boilers, intended more particularly for canal-boats and steam-tugs, but applicable to land or any purpose or place where economy of fuel and space is desired, of which the following is a specification:

Figure 1 is a longitudinal section, and Fig. 2 is a transverse section, of my boiler. Fig. 3 is a transverse section of the tubes, showing the bridge-wall blocks.

This invention relates to a boiler of the water-tube type, and it consists, first, of water-tubes inclining downward from their front ends, at an angle of about twenty degrees, to a point just in rear of the bridge-wall, whence to the rear ends they are horizontal or nearly so, whereby, at their forward and hottest ends, steam and hot water have a free escape upward; and the tubes are, at all points, substantially transverse or at right angles to the draft or current of hot products of combustion, and are all equally exposed to the heat thereof; second, in a bridge-wall, constructed of blocks slipped onto the pipes, and overlapping each other, whereby the pipes are not cramped in their expansion and contraction; third, in external form, a box, A, with semi-cylindrical top, provided with a steam-dome, *a*.

The interior chamber, composing the furnace and tube-box B, corresponds somewhat to the outside shell in shape, with a flat elliptical top, reaching within five inches or six inches of the water-line, and the vertical walls slightly inclined to provide a gradual increase of water-space. The front and back heads *b* of this chamber are drilled to receive and support the tubes *c*, which stretch across through the interior in vertically-staggered rows, which staggering makes the tube-surface more effective. The axes of these tubes are horizontal or slightly inclined from back tube-sheet to a point in line with bridge-wall D, then deflect upward at an angle of about twenty degrees, passing through the bridge-wall, over the grates, to the front tube-sheet. The object of this is to cause rapid circulation, induced by

the tubes being inclined. The bend caused thereby provides for expansion and contraction, which in all straight tubes cause an enormous strain on the tube-sheets. The plates of outside shell are also provided with circular openings, E, corresponding with the center line of tubes, for the purpose of cleaning and replacing, and are closed with suitable plates and nuts, or the holes tapped and bungs screwed in. The lower portion of the front is pierced with an opening of proper size for furnace-door F. At the rear of the furnace-chamber, and above the tubes, there is an opening, G, of proper size, for the purpose of being able to examine and clean the upper space above the tubes; also, to replace a crown-bolt without removing the tubes. This opening communicates with the smoke-stack H, and is closed by a suitable damper, I, which will be found advantageous in starting the fire, because opening this damper will allow the products of combustion to pass directly into the stack, which may be formed on the back of the boiler; when the fire is well started, this damper is closed, causing the products of combustion to pass downward through the tubes to the base of the stack. At the back end of the furnace-chamber, and under the tubes, is placed a mud-drum, J, attached to the leg of the boiler, in which the feed-water is received. When in position, this boiler rests upon a casting, K, forming the ash-pit and smoke-flue, which also furnishes the support for the grate-bars and bridge-wall D; an opening, L, is formed in the side of same for cleaning. The extension of the bridge-wall upward among the tubes is formed of blocks *d* slipped on each tube, and projecting far enough to lap the block on the next tube below, but not to come in contact with the tube, which allows each tube to expand and contract independent of the others. Below the tubes the bridge-wall D is formed, preferably of fire-brick, supported by a plate of iron at the back.

From the above description, it will be perceived that the tubes rest in, and are wholly supported by, their coupling to the tube-sheets *b* and *b*, and that their change of direction at or near the bridge-wall places their midway portions at a distance from a right line, join-

ing their ends; therefore, any expansion or contraction lengthwise will be partly or wholly counterbalanced by an increased or diminished deflection of said tubes, and thus the tube-sheet connections will be subjected to less strain than would be the case if said tubes were straight. This effect is facilitated by the structure of the bridge-wall, which permits the utmost freedom of motion there.

Having described our invention, what we claim as new is—

1. The water-tubes C C, connected at their rear ends to the rear tube-sheet *b*, and passing thence forward, horizontally or nearly so, to a point just in rear of the bridge-wall, then, bending upward at an angle of twenty degrees or thereabouts, they pass through the bridge-wall and over the grate to the front tube-sheet *b'*, thereby being at all points transverse or at

right angles to the draft, and with a free upward discharge at the hot end, substantially as set forth.

2. A bridge-wall formed of blocks *d d*, slipped onto, and combined with, the water-tubes, so as to lap one another and permit freedom of motion in said tubes in expanding and contracting, as set forth.

3. In combination, the within-described tubes *c*, bridge-wall *d*, furnace-chamber B, surrounded by an outside shell, with steam-dome and flue H, and direct damper G, arranged substantially as described.

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Witnesses:

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