

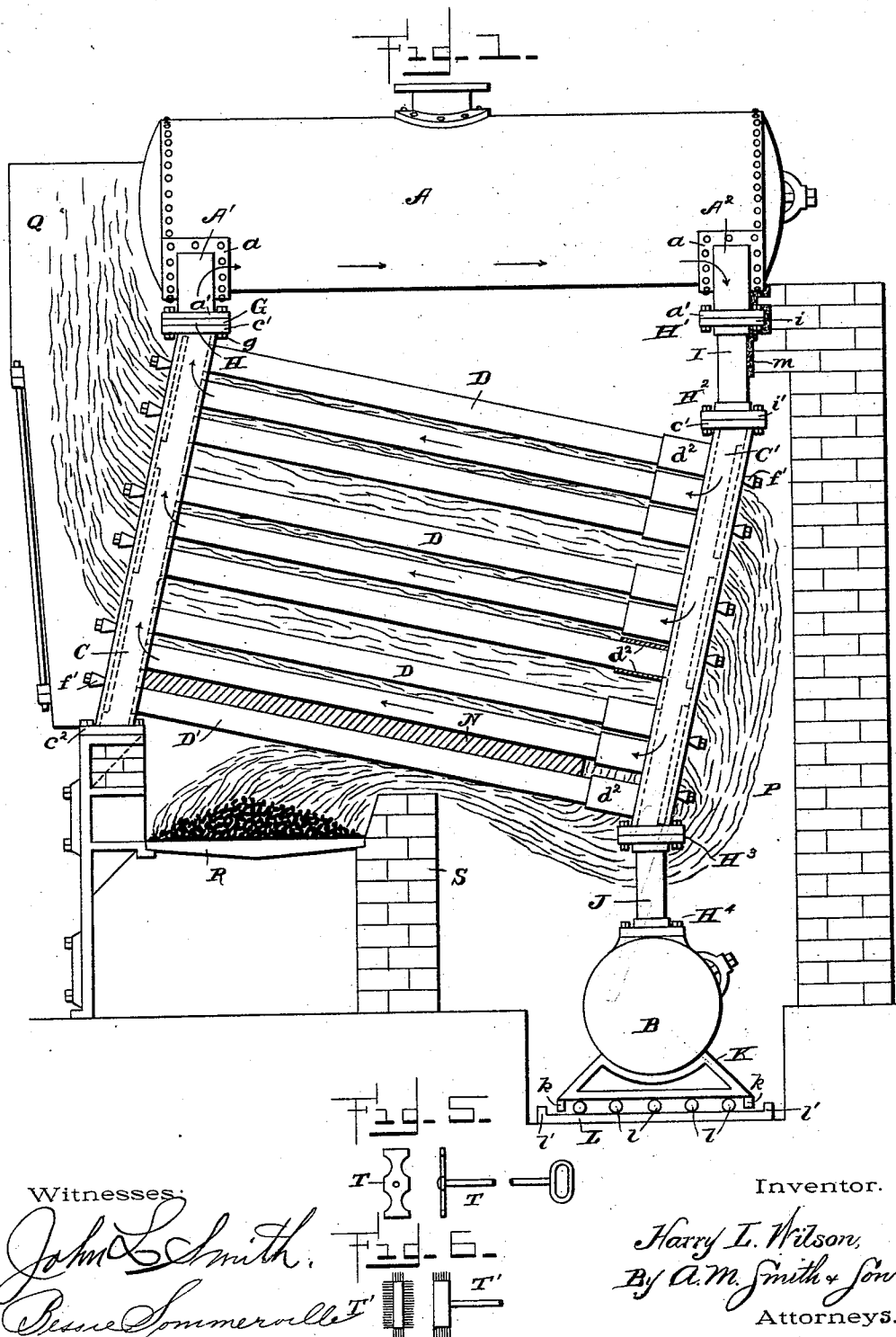
(No Model.)

2 Sheets—Sheet 1.

H. L. WILSON.
WATER TUBE BOILER.

No. 536,449.

Patented Mar. 26, 1895.



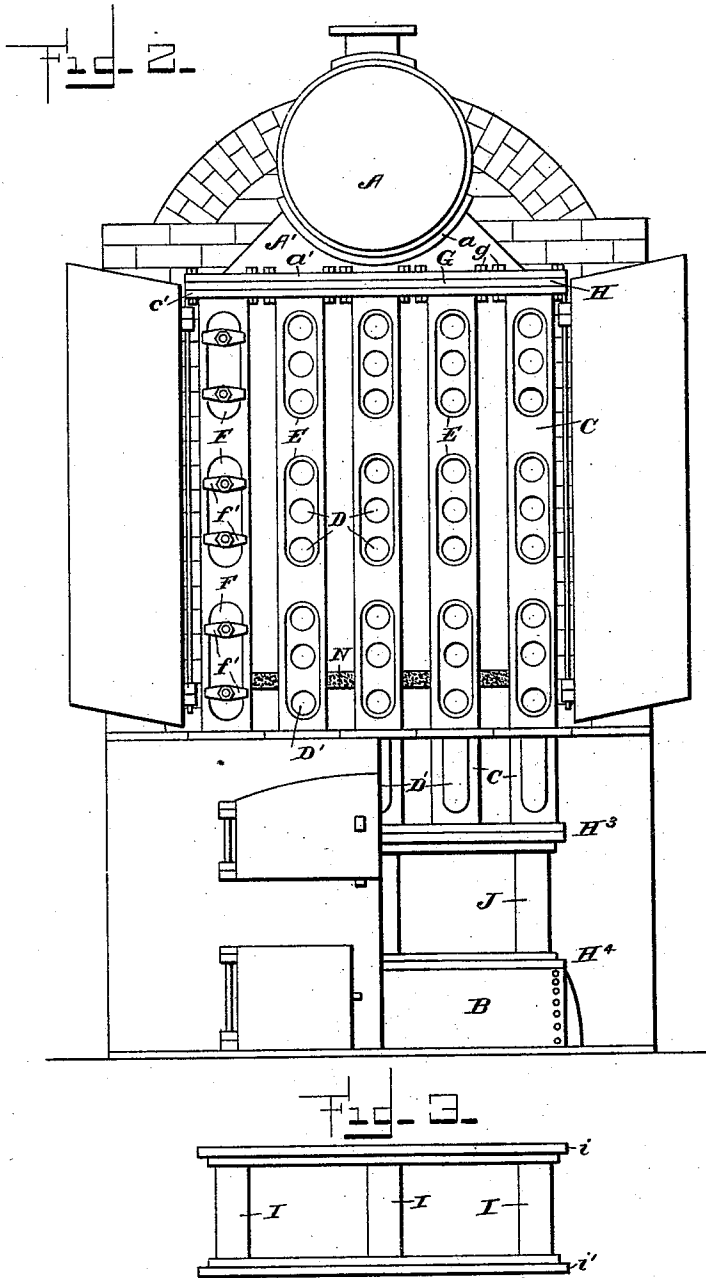
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2 Sheets—Sheet 2.

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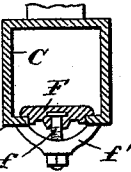
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Witnesses:

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UNITED STATES PATENT OFFICE.

HARRY L. WILSON, OF ERIE, PENNSYLVANIA.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 536,449, dated March 26, 1895.

Application filed December 22, 1894. Serial No. 532,686. (No model.)

To all whom it may concern:

Be it known that I, HARRY L. WILSON, a citizen of the United States, and a resident of Erie, county of Erie, and State of Pennsylvania, have invented a new and useful Improvement in Water-Tube Steam-Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to a novel construction of water-tube steam boilers, whereby a freer circulation of the products of combustion among the tubes and boiler heads and freer access thereto, both inside and outside is attained; to the construction of the joints between the main and tubular portion of the boiler and the steam dome or drum and mud drum; to the manner of cushioning the boiler and providing for its expansion and contraction, and to the means for protecting the joints between the tubes and the boiler heads or upright tubes, all as hereinafter described and claimed.

In the accompanying drawings:—Figure 1 represents a side elevation of a stationary boiler, embracing my improvements, with the adjacent inclosing wall removed to show the arrangement of the parts. Fig. 2 is a front elevation of the same, with parts of the furnace broken away, for a similar purpose. Fig. 3 is a rear elevation of one of the tubular extensions, connecting the boiler proper with the steam and mud drums. Fig. 4 represents a horizontal section through one of the boiler tube-heads, and Figs. 5 and 6 are views of the scraper and brush, employed for cleaning the tubes.

A indicates the steam drum; B, the mud drum; C, C', the tube heads, and D, D', the tubes, said parts being arranged, preferably, substantially as shown in the drawings, with the tubes D and D', inclining rearwardly and with the upright headers C and C', preferably substantially at right angles thereto.

The tube or boiler heads instead of being made each in a single perforated sheet, as usual, are divided or made, one for each row of tubes, and in tubular form, preferably in the rectangular form shown in Fig. 4, as better adapted to give access to the tubes, and at the same time while giving greater capac-

ity to the tubes, leaving more space between the headers for the passage of the products of combustion than would be afforded by cylindrical headers, of the same capacity. The tubes are united to these headers in front and rear in the usual manner of securing them to tube sheets and each header tube is made separate from the others and each is provided with a foot and cap flange c' and c^2 , through which it can be bolted to its support or to the steam drum or other part above it. Each header C is provided with hand holes E, sufficient in number to give access to all the tubes, for removing scale, &c., and these are covered, when the boiler is in use, by removable, flanged cover plates F, held in place by means of bolts and nuts f and crabs f' , in the usual or any suitable manner.

Upon the rear, lower ends of the tubes D, are placed, loosely, collars or short sleeves d^2 , which abut snugly against the headers C' and serve to cover and protect the joints of the tubes with the headers from the action of the acids and heated gases of the products of combustion, thereby greatly increasing the durability of the tubes. The inclination of the tubes is sufficient to keep the sleeves snugly in place. The sleeves may be used at other points, if desired.

The steam drum A has at its ends pendent yoke-shaped ports A' and A², united to the drum by semi-circular or curved flanges a , conforming to the lower face of the drum, the pendent ports expanding laterally thence to a width sufficient to cover the headers or tubes connecting therewith. The bottoms of these ports are provided with horizontal rims a' and between the top of the headers C and the port A', is secured a hollow or annular plate G, through bolts g , passing through the flanges a' and plate G, serving to unite the parts forming the joint at H, between the several headers and the steam drums. Similar joints are formed between the steam drum and boiler at the rear end and also between the boiler and mud drum, or between said parts and the connecting tubes, at H', H², H³ and H⁴, except that the hollow or annular plate G, may be omitted if not required.

To give the desired depression to the headers C' and rear ends of the tubes D, upright tubes I are arranged between the rear end of

the steam drum or pendent port A² and said headers, said tubes being united in perforated cap and bottom plates *i* and *i'*, through which they are bolted to the port and header flanges, as explained. A similar tube section J, having top and bottom flange plates, serves to connect the lower ends of the headers C' with the mud drum B by joints at H³ and H⁴.

10 The mud drum rests in a base or cradle K conforming on its upper face to the lower face of the drum and having a flat lower face, resting on anti-friction rollers *l, l*, arranged transversely of the boiler between pendent flanges *k, k*, at the sides of the base or cradle K. The rollers *l, l* rest and are free to roll on a plate L having upturned edge flanges *l', l'*, which limit the movement back and forth of the drum base K and prevent the escape of the rollers *l*. By this arrangement the boiler as a whole, which has its forward end rigidly secured in the supporting brick work, has its longitudinal extension under the action of heat provided for, the mud drum supporting its rear end, moving freely on the supporting rollers. This expansion is further provided for at the upper end of the boiler or steam drum, and wherever the latter rests in the brick work, by an interposed packing or mineral wool, or asbestos, indicated at *m*, which yields or is compressed by such expansion and thereby prevents the cracking of the supporting and inclosing brick work.

Above the lower, horizontal layer D', of the tubes D, is arranged a deflector N, extending transversely from side to side between the furnace walls and from the front headers C to or nearly to the rear headers C' as shown. This deflector is made, preferably, from fire-clay and serves to deflect the products of combustion rearward, to the rear end of the boiler, proper, to a rear combustion chamber indicated at P, whence they pass forward again between the headers and upward through and among the tubes D, to the smoke box, at Q, at the forward end of the boiler and thence up into the smoke stack, as indicated in the drawings. The general direction of the circulation of the water in the tubes, headers and steam drum is indicated by arrows in Fig. 1.

By the inclined arrangement of the tubes D, D', space is provided under the higher forward ends for the location of the furnace grate R, in a plane on a level or nearly so with the rear, lower ends of the tubes and headers D' and C' and the products of combustion passing from the furnace over the fire wall or bridge S, are deflected thence downward and rearward by the deflector N, thereby giving them increased efficiency.

T and T', Figs. 5 and 6 indicate, the one a scraper and the other a brush for cleaning the outer faces of the tubes from soot and other accumulations of foreign matter. The form shown adapts them to act on two of the tubes at the same time, and the arrangement of the

divided tube sheets or separate heads facilitates access to the tubes for cleaning, as explained.

Parts of the boiler and furnace not particularly described, may be of any usual construction.

By making the five joints, H, H', H², H³ and H⁴, as described, the several parts of the boiler, viz, the steam drum, the header sections, with their connecting tubes, the tubular extension sections I and J, and the mud drum, can each be fully completed at the factory, leaving only said connecting joints to be made, in setting up the boiler, thereby greatly facilitating the labor of setting the boiler.

The deflector N, instead of being placed immediately above the lower layer of tubes, may, if desired, be placed above the second or third layer from the bottom, according to the number of tubes it is found desirable, in practice, to expose to the direct action of the fire. In some cases it may be found desirable to spring a fire arch over the fire-pot and immediately beneath the tubes to protect the latter from a too intense heat.

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

1. In a water-tube boiler, the spaced headers at the front and rear of said boiler, in combination with the combustion chamber in rear and the smoke box in front of said headers, whereby the products of combustion are made to pass between the headers in passing from the combustion chamber to the smoke box, substantially as described.

2. The combination in a water-tube boiler of the front and rear headers arranged to permit the passage of the products of combustion between adjacent headers, the tubes connecting the front and rear headers in pairs, the combustion chamber in rear and the smoke box in front of the headers, the steam drum connected with the headers above the path of the products of combustion and the deflector arranged to force said products back to the combustion chamber whence they return, between the headers to the smoke-box, substantially as described.

3. The combination in a water-tube boiler of the steam drum, the headers connected therewith arranged to permit the passage of the products of combustion between adjacent headers and beneath said drum, the front and rear headers being connected in pairs, the tubes connecting said headers, the mud drum, and the upright tube-sections I and J, provided with the connecting cap and bottom plates, interposed between the headers and the steam and mud drums, substantially as described.

4. The combination in a tubular boiler, of the steam drum, the divided tube heads and connecting tubes, the upright tube-sections, the mud drum and the joints connecting said parts, constructed, substantially as and for the purpose described.

5. In a water-tube boiler, the tubes D and D', in combination with the loose collars or short sleeves on said tubes, abutting against the tube sheet, substantially as and for the purpose described.

6. In a water-tube boiler the forward end of which is rigidly secured to its support, the mud drum at its rear end mounted in a supporting cradle K, provided with pendent end flanges, the base plate L provided with upturned end flanges and the series of anti-friction rollers interposed between said cradle and base plate, substantially as and for the purpose described.

7. The boiler rigidly secured at its forward end, in combination with the supporting walls at its rear end, and the interposed elastic packing of mineral wool or asbestos, substantially as described.

8. In a water-tube boiler the forward end of which is rigidly secured to its support, the combination with its supporting walls of the elastic packing at the rear end of said boiler

and the anti-friction supporting rollers for permitting the expansion and contraction of the boiler, substantially as described.

9. In a water-tube boiler, the combination of the steam drum, the front and rear headers connected therewith and arranged to permit the passage of the products of combustion between adjacent headers, the tubes connecting the front and rear headers in pairs, the mud drum, the upright tube sections connecting the mud and steam drums with the rear headers, the interposed, cap and bottom plates uniting the upright tubes, the rear combustion chamber, the smoke-box in front, and the deflector N, all arranged and operating substantially as and for the purpose described.

In testimony whereof I have hereunto set my hand this 7th day of December, A. D. 1894.

HARRY L. WILSON.

Witnesses:

C. B. HAYES,
P. H. McMAHON.