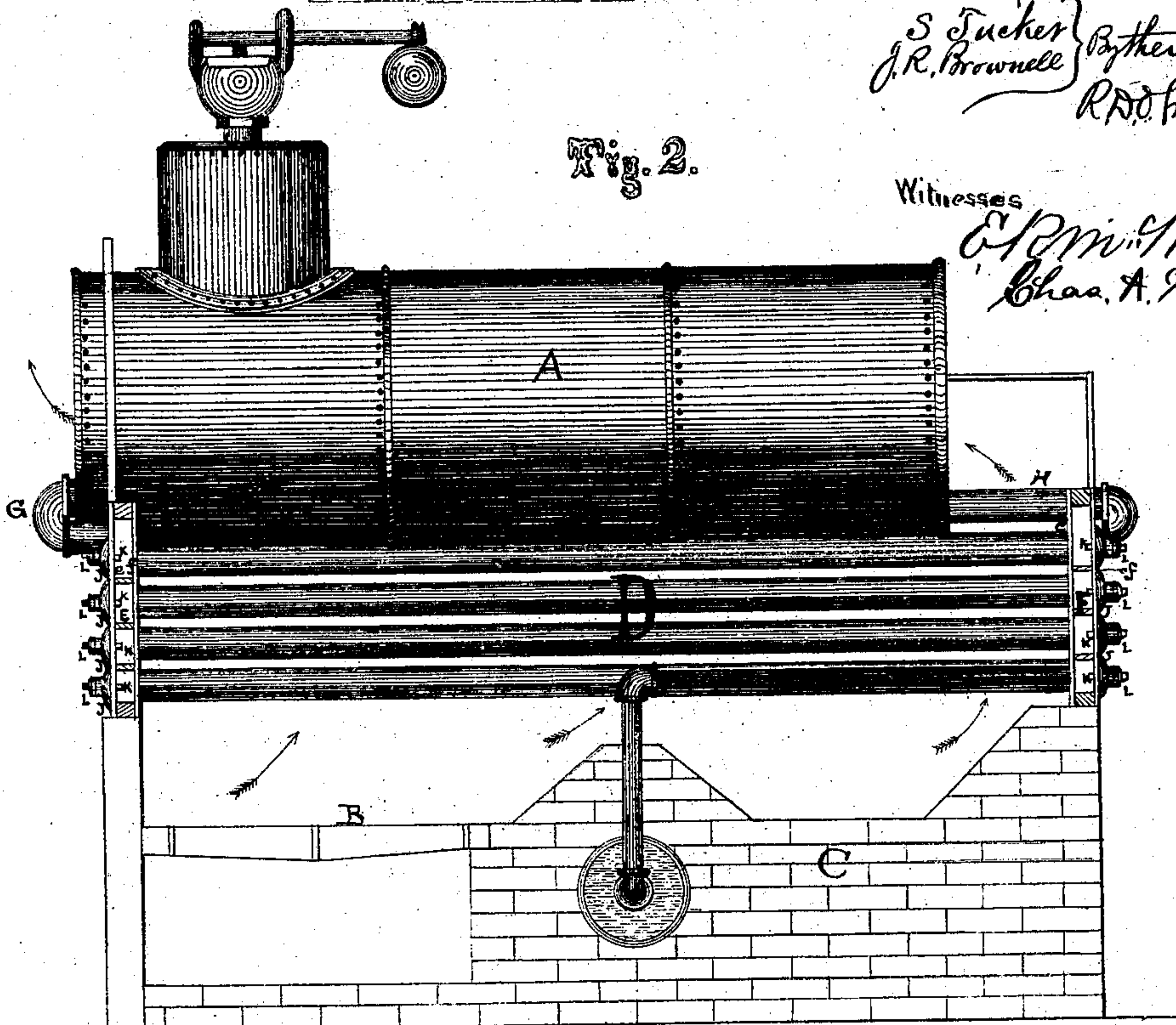
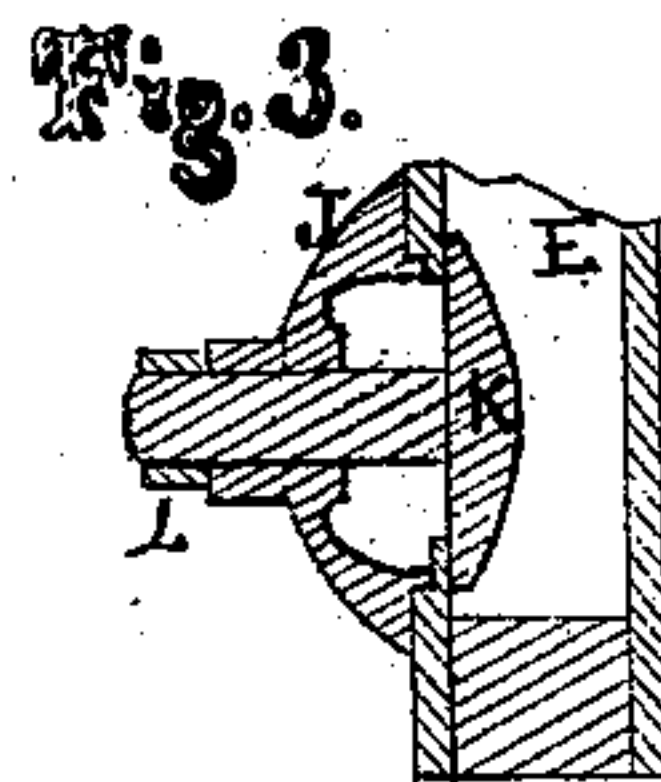
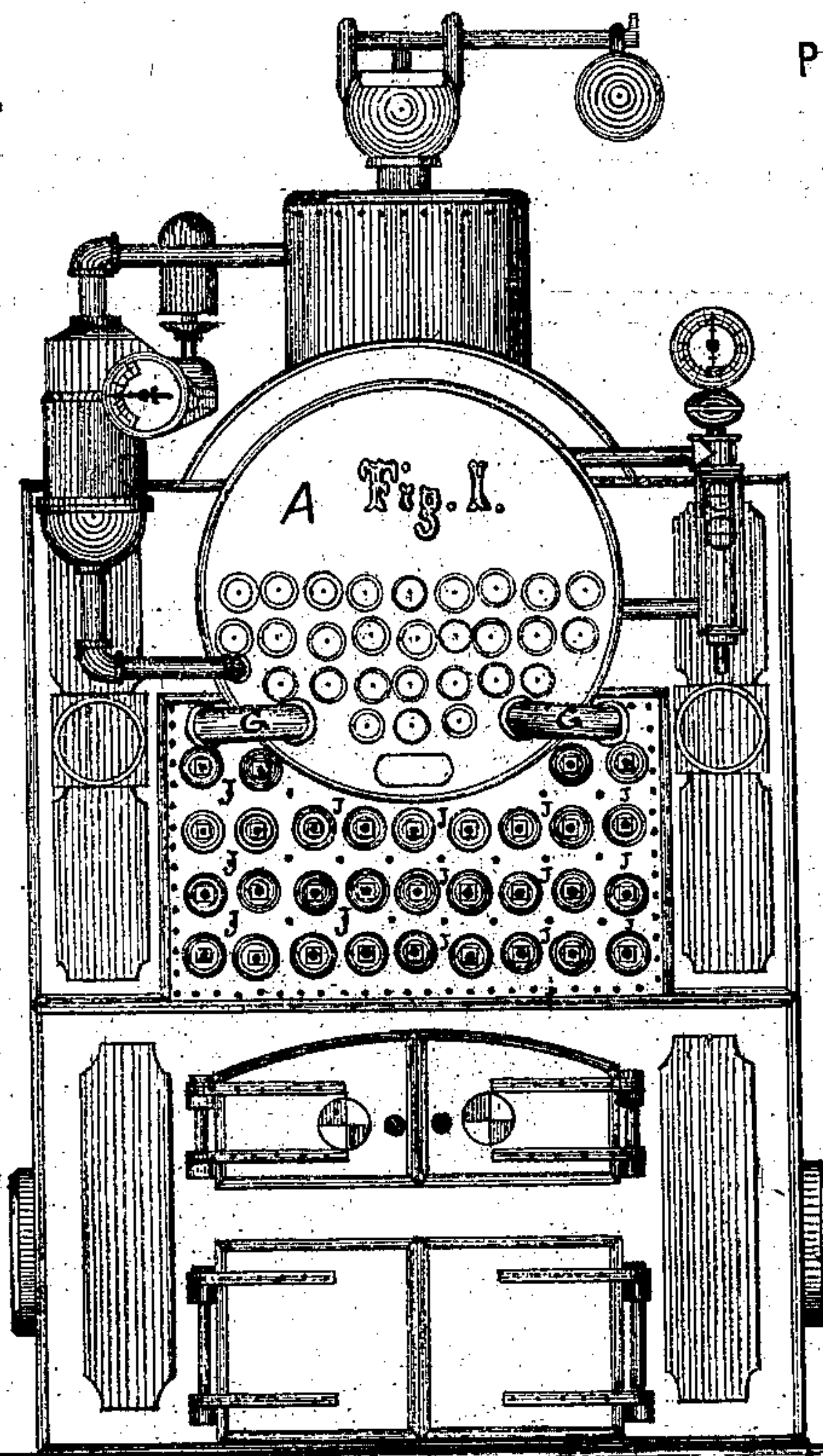


S. TUCKER & J. R. BROWNELL.

Improvement in Steam Boilers.

No. 115,993.

Patented June 13, 1871.



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Witnesses  
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# UNITED STATES PATENT OFFICE.

SEWALL TUCKER AND JOHN R. BROWNELL, OF DAYTON, OHIO.

## IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 115,993, dated June 13, 1871.

*To all whom it may concern:*

Be it known that we, SEWALL TUCKER and JOHN R. BROWNELL, of Dayton, in the county of Montgomery and State of Ohio, have invented a new and useful Improvement in Steam-Generators; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, in which—

Figure 1 is a front elevation. Fig. 2 is a side elevation, partly in section. Fig. 3 is a section of water-front, showing manner of closing hand-holes.

Our invention relates to tubular or tubular-and-flue steam-generators; and consists in the combination of a tubular or flue boiler with exterior hot-water tubes or flues. The object of this invention is to utilize a greater proportion of the furnace heat than has been hitherto done.

To generate steam economically it is necessary that water and not steam shall be the recipient of the first or the most intense heat, and that the water shall be kept in contact with the heated surfaces to absorb the heat. It is also necessary that water shall have free escape when heated, to give place to fresh particles of cool water, to be heated in turn. This result is best accomplished by circulating water-pipes opening into a water-space connected with the steam-generator chamber, said pipes being placed so as to receive the first and most intense heat of the furnace, and thereby heat the water to a high degree before it enters the chamber where it becomes converted into steam, and where it is acted upon by the hot gases after they have expended the principal part of their heat among the water-pipes below.

That others may understand our invention, we will particularly describe it.

A is a boiler of ordinary tubular construction. B is the grate; and C is the brick setting, similar to that usually employed. The boiler A may be raised somewhat higher than usual to afford space for the tubes D D immediately over the fire-box. The tubes D D are connected at front and rear ends by the water front and back E F, and with the boiler A by means of the water-circulating tubes G H.

This constitutes a water-circulating heater, in which the water is raised to or above the evaporating temperature before it enters the boiler A, where its transformation into steam may take place. The hot products of combustion pass among the tubes D before passing into the tubes or flues of the boiler, and therefore the greater portion of the heat will be absorbed by the water in the tubes, and the products of combustion, when they leave the boiler, will be but little, if any, above the temperature of the steam in the boiler. The water front and back E F are constructed with front and back sheets, *e f*, and the tubes D are inserted through the latter and secured in the usual manner. The front and back sheets *e f* are firmly riveted to a frame, and stays are inserted between them where it may be necessary. The spaces E F between the front and back sheets *e f* connect the pipes D much more perfectly than where two pipes are coupled with a bend, because the water is not then compelled to follow back and forth through the tubes before reaching the boiler, but may take the more direct course through the connecting-chamber. Opposite each tube the sheets *e* of the water front and back are perforated so as to permit each tube to be cleaned readily or to be repaired, if required; and each of said perforations or hand-holes is closed by a plate, J J, which is fitted to said hole from the outside, and is secured in place by the bolt K, the T-head of which rests on the inner surface of the front sheet. The screw-shank extends through the plate J, and the nut L binds them securely in place and to each other.

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

A tubular or flue boiler, A, combined with a water-circulating boiler composed of tubes or flues D united at their ends by the hollow water front and back E F, and connected with said tubular or flue boiler A by the circulating-pipes G H, substantially as set forth.

SEWALL TUCKER.

JOHN R. BROWNELL.

Witnesses:

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