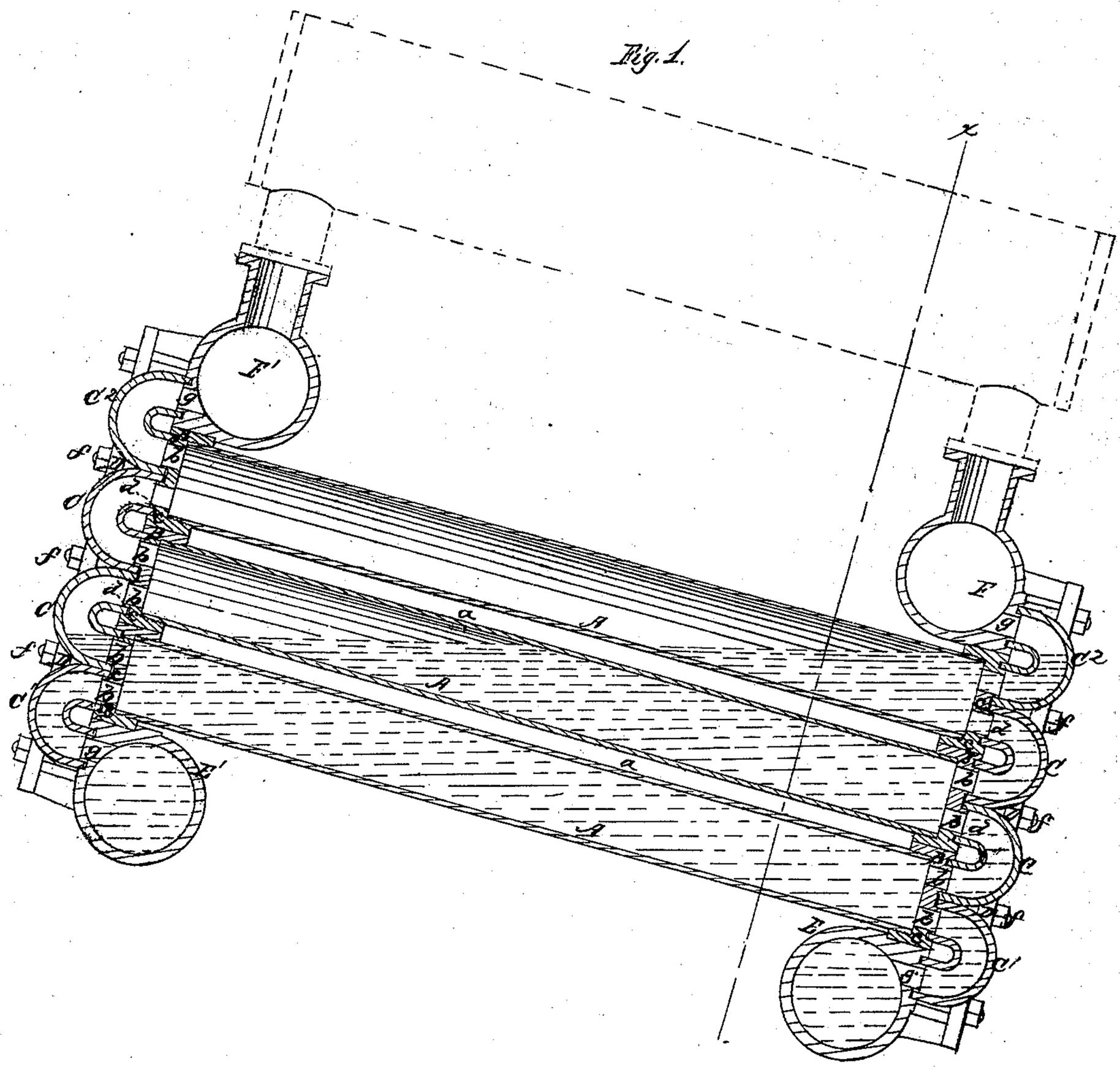
Sheet 1 - 2 Sheets.

J. B. Root.

Steam-Generator.

No. 74146 Patented Feb. 4, 1868.

Fig. 1.



Witnesses

J. McComb

Akellerey

Inventor.

John B. Root

Sheet 2 - 2 Sheets.

J. B. Root.

Steam-Generator.

No 74146 Patented Feb. 4, 1868.

Fig. 3.

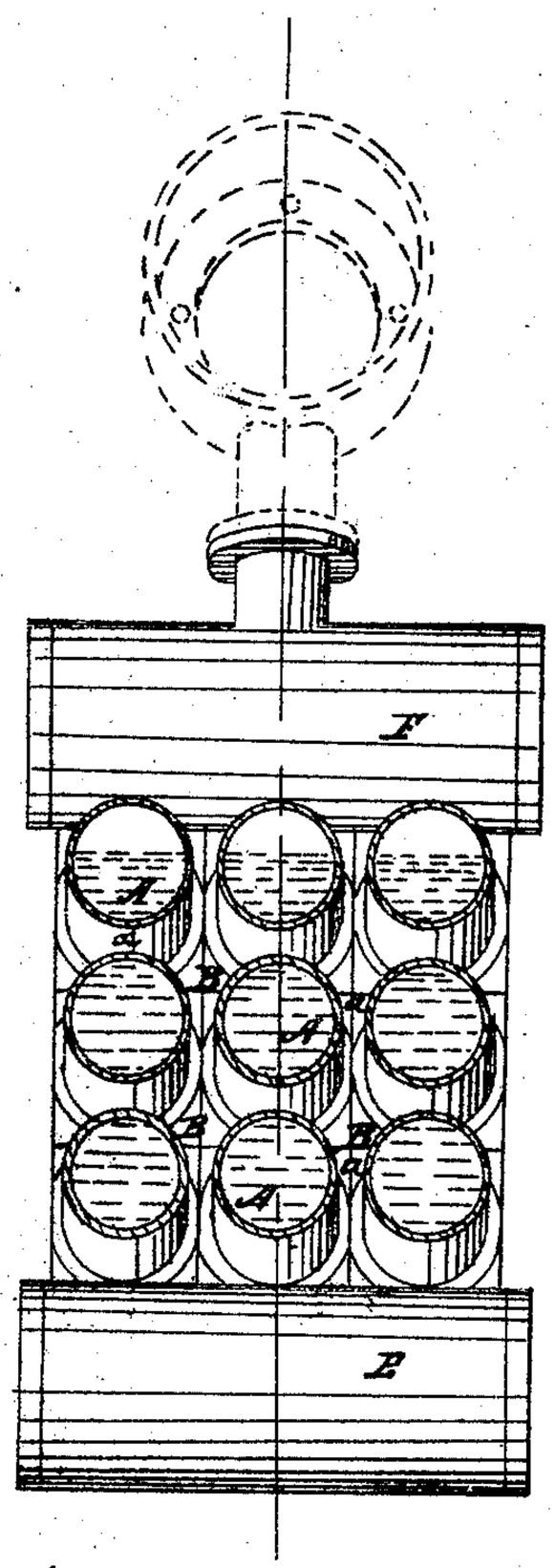
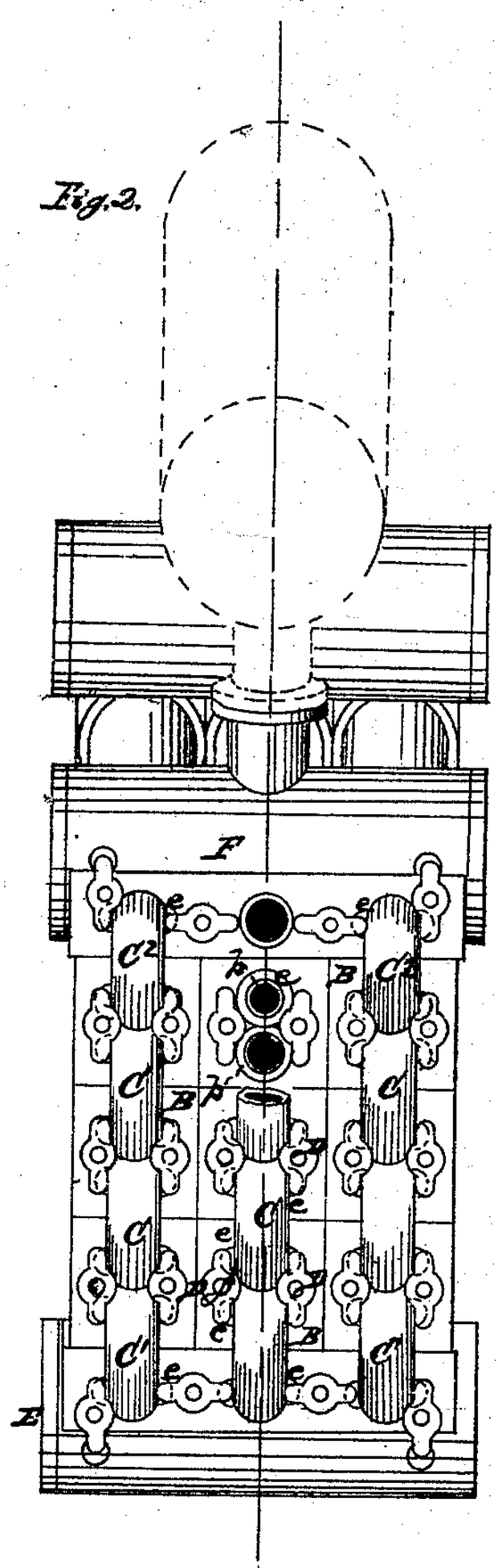


Fig. 2.



Witnesses.

J. McComb

Akellerey

Inventor.

John B Root

United States Patent Office.

JOHN B. ROOT, OF NEW YORK, N. Y.

Letters Patent No. 74,146, *dated February* 4, 1868.

IMPROVEMENT IN STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN B. ROOT, of the city, county, and State of New York, have invented a new and useful Improvement in Steam-Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing forming part of this specification, and in which—

Figure 1 represents a longitudinal section of a steam-boiler constructed according to my improvement.

Figure 2, an end view thereof, with one of the return-bends removed, and another shown only in part; and

Figure 3, a transverse section of the same through the line *x x* in fig. 1.

Similar letters of reference indicate corresponding parts.

The objects aimed at in this improved boiler, and which are claimed to be effected in a most perfect manner, are, safety or freedom from serious and general explosion, cheapness, lightness, compactness, durability, and economy in working.

The invention consists, firstly, in a novel means of connecting, by return-pipes or bends, tubes arranged in a tier, one above the other, over the fireplace, and containing the water to be heated, while the fire plays outside the tubes, said return-pipes communicating with apertures, one over the other, at the ends of the tubes, and connecting each tube with one above and below it, whereby a perfect circulation is kept up, foaming prevented, and the steam kept drier.

The invention also consists in a peculiar manner of attaching said return-pipes to the tubes by free-socket joints, provided with packing and outside clamps, carried and secured by stud-bolts, whereby every provision is made for unequal expansion of the parts, and the return-pipes allowed to tip or twist without straining the main tubes.

Likewise, the invention consists in constructing the ends of the boiler of a series of plates, of square or parallelogramic form, fitted to each main tube, and serving, by means of apertures, to connect the main or water-tubes with each other, by pipes or bends.

And furthermore, the invention consists in a connection of cross water-pipes with the main tubes, by means of return-pipes or bends, as aforesaid, and arranged to communicate with said tubes, or certain of them, at their ends, without breaking the continuity of the tubes.

Referring to the accompanying drawing, A A represent tubes, made, say, of wrought iron, of any suitable length, diameter, and thickness of metal, and of any desired number, arranged to lie one above the other, and of which there may be several series, lying side by side, with flue or air-spaces, *a a*, around each of the tubes that are here represented as occupying inclined positions to the horizon, sloping upwardly from the rear toward and over the fireplace. These tubes A A are screwed or fitted at their opposite ends into independent plates or blocks, B B, of square or parallelogram form, which, when combined and in their places, constitute the ends of the boiler, and through which the connections of the tubes A A with each other in each vertical series are established. If preferred, the tubes A A may be of cast metal, with the plates B B cast thereon. To make such connection, each plate B is provided with apertures *b b*, the one lying above the other, and around each of such apertures an annular socket, *c*, made, within which may be inserted an India-rubber ring, *d*, or other soft and elastic packing, and into these sockets the ends of return-pipes or bends, C C, fitted, said bends connecting the upper aperture, *b*, at each end of one tube, A, with the lower aperture *b* at the same end of the next tube A, above, and being secured or held to their places by clamping-bars, D D, lapping over, or on lugs or projections *e e*, and fastened by nuts and stud-bolts, *f*, connected with the plates B, and said clamping-bars being preferably so constructed and arranged as that either one bar serves to bear on or hold two of the return-pipes or bends C C. Cross-pipes E E′ F F′ are, or may be, arranged above and below the tubes A A, at opposite ends, which cross-pipes should be connected with the upper and lower rows of the tubes A A, by or through bends or pipes C^1 C^2, connecting the nearest of the apertures *b* of said tubes with apertures *g*, in a similar socketed manner to that used in establishing the connection of the return-pipes C C, and being similarly held or secured by clamping-bars and stud-bolts connected with the cross-pipes, only setting such clamping-bars to lie at right angles to those previously described, so that all the clamps or clamping-bars may be alike, as also all the plates or blocks B B, and return-pipes or bends C C and C^1 C^2, likewise main pipes or tubes A A, by which similarity or duplication of parts, not only is there economy in construction, but increased facility afforded

for fitting or changing of parts, and extending or diminishing, by increasing or lessening the number of tubes, the capacity of the boiler at pleasure, and it will readily be perceived that, by this construction, any of the tubes A A may be removed without disturbing the others. The bends or return-pipes, being small, may be made light, but strong enough, of cast iron, to prevent them bursting, in advance of the tubes A A of sheet metal, while the latter, not being connected either with each other or the cross-pipes, excepting through the end-plates B B, are not cut away or weakened. If desired, the lower arms or legs of the return-pipes may be made longer than the upper ones, so as to admit, in an inclined position of the boiler as represented, of the ends of the tubes A A, and their plates B B, lying in a vertical plane. The boiler generally, at least at its sides, may be set in brick-work, but its ends, if desired, be covered by sheet-iron jackets, to prevent loss by radiation from said ends, and the return-pipes or bends. In some cases the upper, E′, of the lower cross-pipes may be dispensed with, the same serving mainly as a bearer; also, where a steam-drum (shown in red lines) is not used, or under other circumstances, the lower one, F, of the upper cross-pipes may likewise be omitted, leaving the upper one, F′, of such pipes to answer as a steam-chest or drum.

From this description it will be seen that by the system here shown, of return-pipes or bends connecting the ends of the tubes A A, as by apertures *b b*, one above the other, steam from the lower tube or tubes carries water up with it into the tube or tubes above, but that this water drops or runs back into the lower tube or tubes again at the lower end, so that lifting of water for more than one length of tube, or thereabouts, and foaming, are prevented, steam passing off into the upper portion of the boiler comparatively dry. In this way a most perfect circulation is kept up, condensed steam or water carried up by the steam from below being returned by the lower of the apertures *b*, while the drier and more highly-heated vapor or steam works its way above by the upper of such apertures, and circulation generally of the water is kept up, without any possibility of water being driven into the steam-space with any force or pressure, and safety-valve blowing off.

Incidental to the construction of this boiler, it may here be noticed, as an important feature, that by the socketed and clamped attachment of the return-pipes or bends C C, provision is made for unequal expansion and tipping or twisting of said pipes or bends, without straining on the tubes A A. It furthermore will readily be admitted that a boiler constructed as described may not only be got up cheap, light, compact, durable, and be economical to work, but that such a boiler is secure against serious or general explosion of its parts.

What is here claimed, and desired to be secured by Letters Patent, is—

1. In combination with the water-tubes A A, the return-pipes or bends C C, arranged to connect each tube with one above and below it, substantially as specified.

2. The bend *c*, for establishing the connection with the water-tubes, by free or socket-joints, when furnished with packing, and held to their places by independent outside clamps, stud-bolts, and nuts, or their equivalents, essentially as shown and for the purpose described.

3. The cross-pipes E E′ and F F′, or either of them, connected with the tubes A A at their ends, by means of independent pipes or bends, C^1 or C^2, essentially as shown and described.

JOHN B. ROOT.

Witnesses:

J. W. Coombs,

A. Le Clerc.