2. Sheets, Sheet. 1.

J. C. Woodhead,

Steam Generator.

No. 112,402. Patented Mar. 7. 1871.

Fig 1

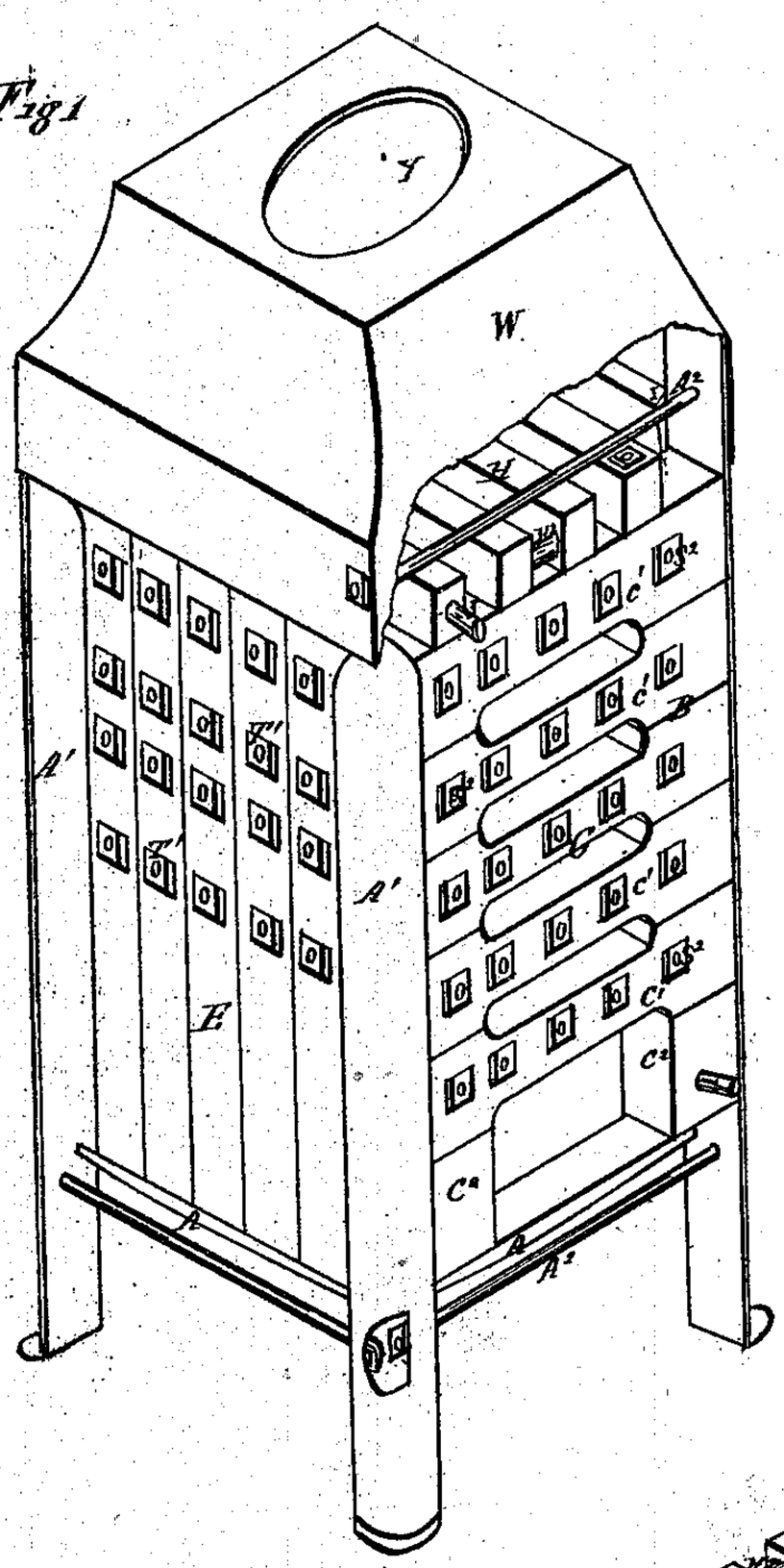


Fig 2

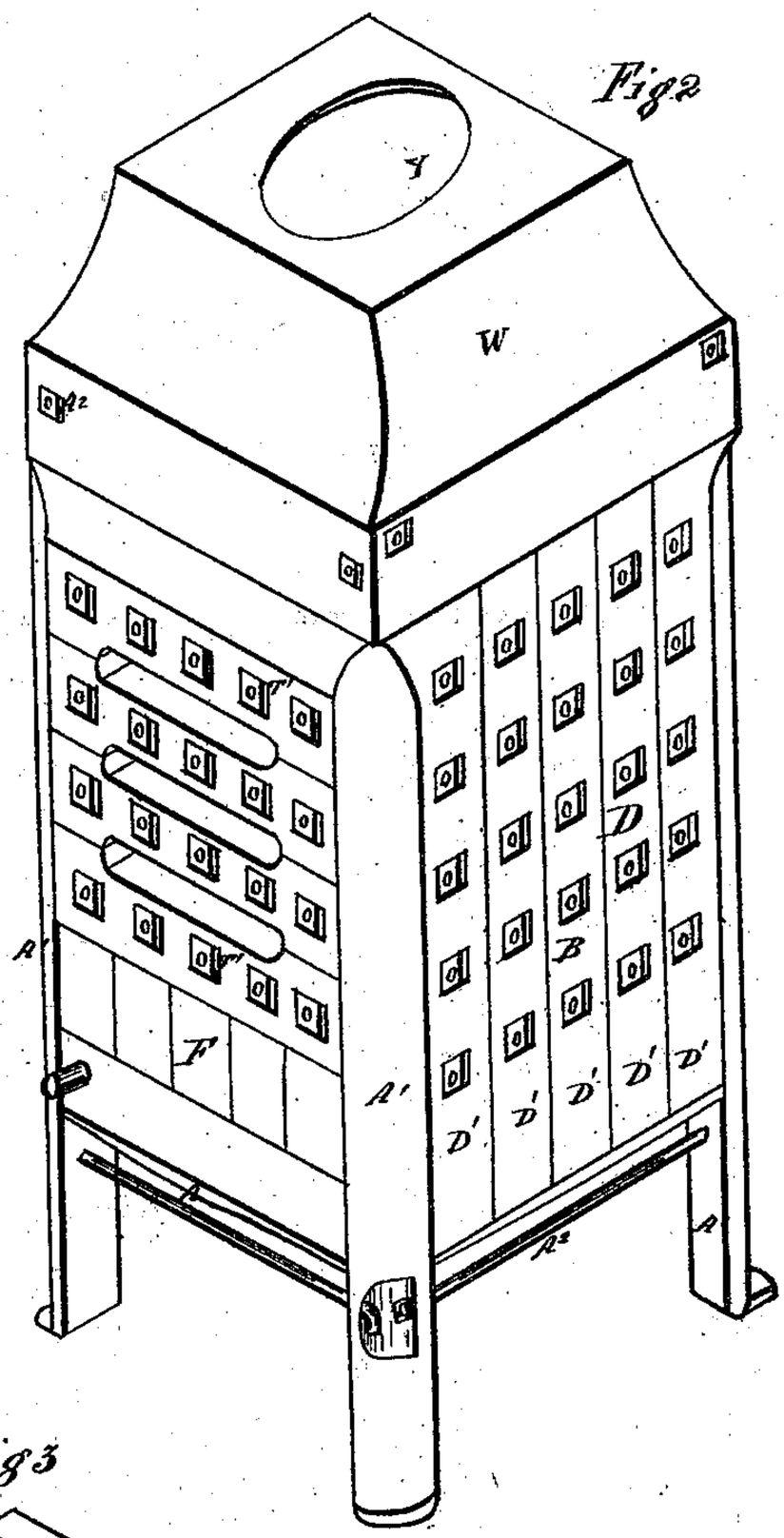
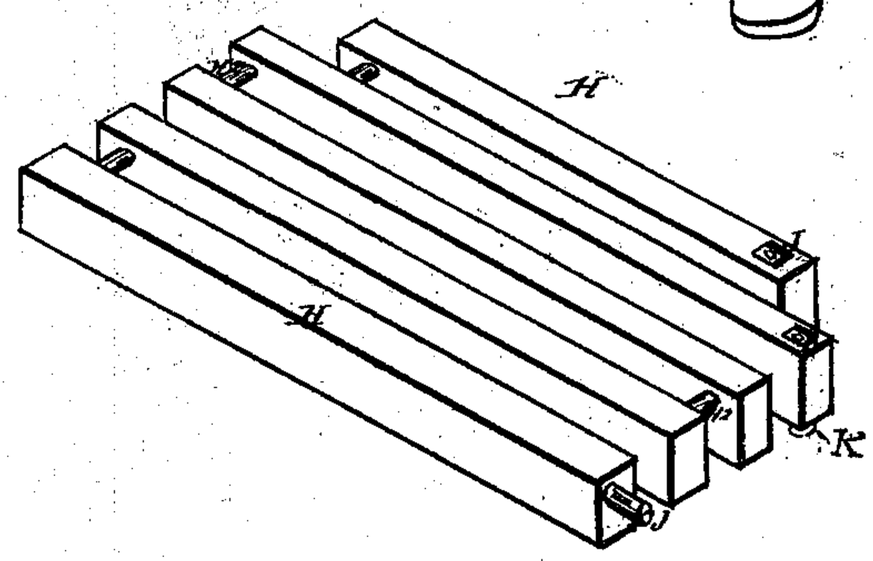


Fig 3



WITNESS.
Percival Beckett
George Miller

INVENTOR.
John C. Woodhead

2. Sheets. Sheet. 2.

J. C. Woodhead,

Steam Generator.

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Fig 4

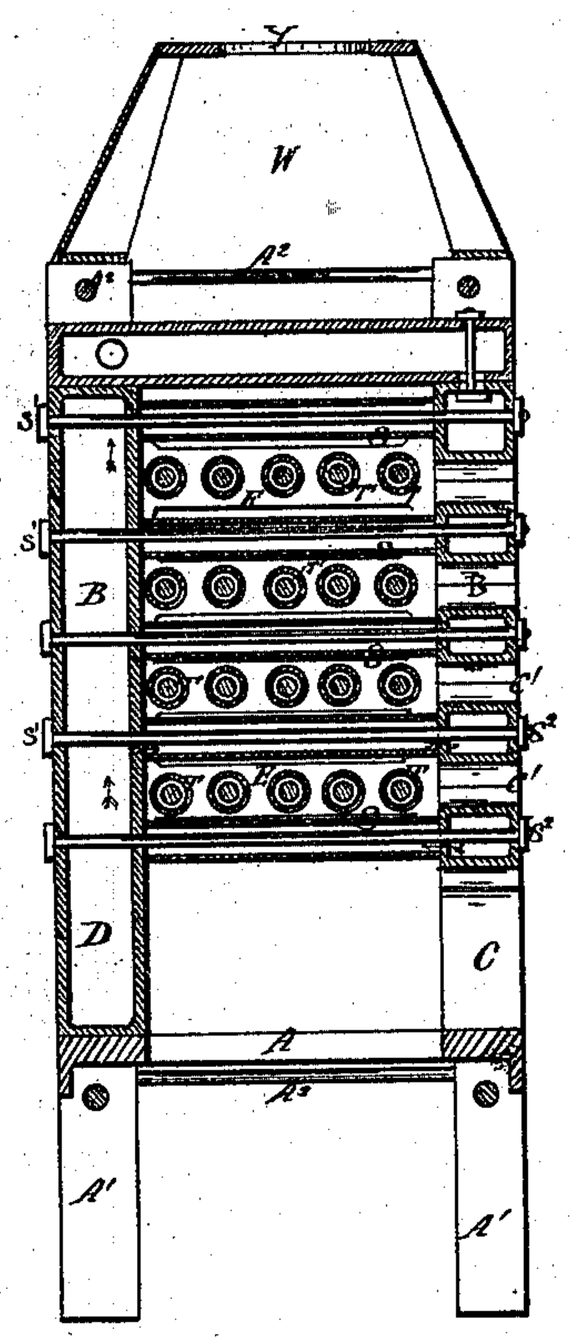


Fig 5

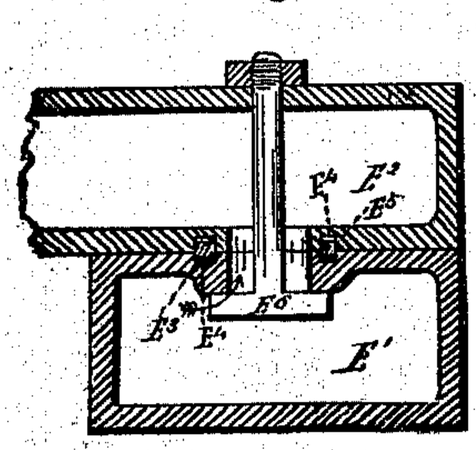


Fig 6

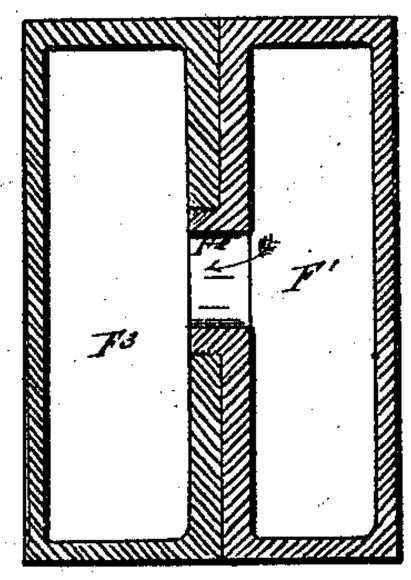
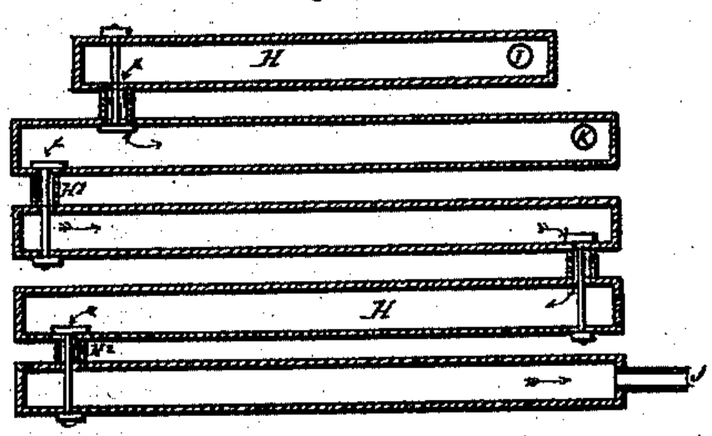


Fig 7



WITNESS.
Percival. Beckett.
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John C. Woodhead

United States Patent Office.

JOHN C. WOODHEAD, OF PITTSBURG, PENNSYLVANIA.

Letters Patent No. 112,402, dated March 7. 1871.

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 C. WOODHEAD, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Generators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon which form a part of this specification.

The nature of my invention relates to that class of steam-generators usually known as "water-tube boilers;" and consists in the construction of such boilers, dispensing altogether with the use of brick-work, forming a quadrangular boiler in which there is no dead surface, all the area exposed to the action of the fire being heating surface, and also steam-generating surface, said boiler being also free to expand transversely or longitudinally.

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

In the accompanying drawing—

Figure 1 is a perspective view of my invention, showing two sides thereof.

Figure 2, a perspective view of the same, showing other two sides.

Figure 3, a perspective view of the crown of the same.

Figure 4, a transverse section thereof.

Figure 5, a section of some of the details.

Figure 6, a section, also, of some of the details.

Figure 7, a sectional view of the crown.

A base-frame, A, of suitable construction, supports and carries the sides of the boiler, and also serves as a frame or bearer for the ordinary grate-bars, forming an ordinary furnace.

Projecting upward from the corners of the said frame A are angle-pieces A^1, of suitable construction, being tied and held rigid together at various places by means of ordinary tie-rods, A^2.

Between each of said angle-pieces A^1 is a series of cellular metal boxes, B, of any suitable shape, forming four sides. C D E F. As shown in fig. 1, on the side C, the boxes are placed horizontally, and are of a quadrangular shape, their central part, C′, being narrower than their ends in such a manner that two of the said boxes, being placed one above the other, there will be sufficient room between them for a passage of a brush, whereby the furnace may be cleaned. These said openings may be fitted with an ordinary door or stopper, to prevent the egress of smoke.

The lower boxes, C^2, of the side C are so arranged and of such a shape as will make an opening suitable for the ordinary fire-door.

The side D, lying opposite and parallel with the side C, consists also of cellular boxes, as shown in the drawing.

The boxes D′ lie vertically and extend from the base-frame A to the crown of the boiler. These boxes D′ are connected to the boxes C′ of the side C by means of ordinary tubes, S, passing at right angles therefrom, an orifice being in each box corresponding to the openings in the tubes S, or thereabout.

The said tubes are jointed to the said boxes in any ordinary manner, and are held thereto by means of bolts S^1 passing through the side D, and tubes S, and side C, and firmly tying the whole together by means of an ordinary screwed nut, S^2. The several boxes forming the said sides can be relatively connected together, if required, in any suitable manner, as seen in fig. 5.

The lower box E^1 has an orifice in its upper part.

The box E^2 has a corresponding orifice.

Encircling these orifices each box has a groove, E^3, in which lies an ordinary packing-ring, E^4.

Between these packing-rings is a metallic ring, E^5.

A bolt, E^6, having a head which entends across the orifice in the box E^2, passes through both boxes, and, being tightened by means of an ordinary screwed nut, holds both boxes together, forming thereby a tight joint.

As seen in fig. 6, the box F^1 has a projection, F^2, provided with screw-threads on its periphery, which screws into an orifice in the box F^3, having female screw-threads therein, holding both boxes tight and making a perfect joint.

The sides E F are composed of cellular boxes, E^1 F^1, of similar construction as those composing the sides C D, and are connected together by means of ordinary tubes T passing over and lying transversely with the tubes S, the said tubes T being jointed to the sides E F, having corresponding orifices therein, and are connected and tied thereto by means of the bolts T′, similar in construction and attached the same as the bolts S^1. The sides C D E F thus form the walls of the furnace, each side being heating surface and each side being a steam-generator.

The crown H of the furnace consists, also, of a series of cellular metal boxes of any suitable shape, as shown in the drawing.

They consist of a series of long quadrangular boxes, lying parallel to each other and connected together by means of ordinary tubes H^2, so that there is a continuous passage through all.

An opening is at I which connects with the side E, so that all the steam arising from the walls E and F passes therein and through the whole section and escapes at the outlet J.

A connection is also made from the side C, at K,

so that all the steam generated in the walls C and D also passes therein, passes through the whole range of boxes H, and also escapes at J.

It may be seen that the four sides C D E F form two complete and separate boilers, save in the connection with the crown H, viz., the sides C and D being connected together by means of the tubes S, the water circulates from the side C to the side D, and inversely form one generator, or a double generator combined in one. The sides E and F being connected together likewise, form a separate generator, while the four combined sides, connected to the crown H, form one boiler, the crown H forming a receiver or steam-drum, and, as it is acted upon by the furnace heat, it becomes a superheater.

The sides C and D being thus connected, may expand laterally or longitudinally, and the sides E and F in like manner, while the angle-pieces A' form a joint at the side, preventing the egress of smoke or heat.

Each section can be supplied with the ordinary boiler-mountings, and each box can be supplied with an ordinary mud-orifice, whereby they may be cleaned from sediment.

I am aware that cellular-boxed water-tube boilers have been heretofore constructed, but only two of the sides thereof are heating or steam-generating surfaces. In some instances the other two sides (if the boiler is quadrangular) are composed of brick-work, or else the whole is surrounded with brick-work, causing thus considerable dead surface on which the action of the fire is lost, consequently causing a material waste of fuel; besides, since brick-work forms part of their construction they necessarily take considerable time and labor, and thereby expense, to erect, besides being a continual expense in the burning out of the brick-work. Boilers, also, of this class have no provision for cleaning save from the furnace-doors without tearing down the brick-work, and thereby causing a stoppage of work.

By the construction of boilers according to my herein-described invention, the whole of the sides are heating surfaces and also steam-generators, consequently no heat is lost, since the whole action of the flame is on the sides, consequently not requiring as much fuel to generate steam as ordinarily; and since the circulation of water from side to side would be perfect, steam would be generated very rapidly. Thus smaller boilers and lower pressure may be used than ordinarily; and since, also, boilers constructed as described do not require any brick-work, they can be erected very speedily and not requiring skilled labor to build the same; and as they can be readily cleaned, less danger of explosion will ensue and; as they are easy of access, can be easily and readily repaired.

My invention is readily applicable to the construction of locomotive, portable, and marine-boilers, especially to the latter, since lightness and smallness of bulk is there required. Boilers constructed as described, having full heating surface, would generate steam more rapidly than the ordinary boilers much larger in bulk, thus saving room.

I do not limit myself to the precise form of boxes shown, nor to their precise arrangement relative to each other; but

Having thus fully described my invention,

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

1. A quadrangular steam-generator, constructed of sectional boxes, forming the walls of the furnace, and having its opposite sides connected by tubes, substantially as described.

2. In combination with the above, a furnace-crown, consisting of a series of cellular metallic boxes so arranged and connected that the steam arising from the furnace cellular walls will pass through the same, the said crown being fully in contact with the heat from the furnace, substantially as and for the purpose described.

3. In combination with the above, a furnace-crown, composed wholly or partly of cellular plates or cellular boxes, so relatively arranged with the furnace-walls that the steam arising therefrom will pass into said crown, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOHN C. WOODHEAD.

Witnesses:

PERCEVAL BECKETT,

GEORGE MILLER.