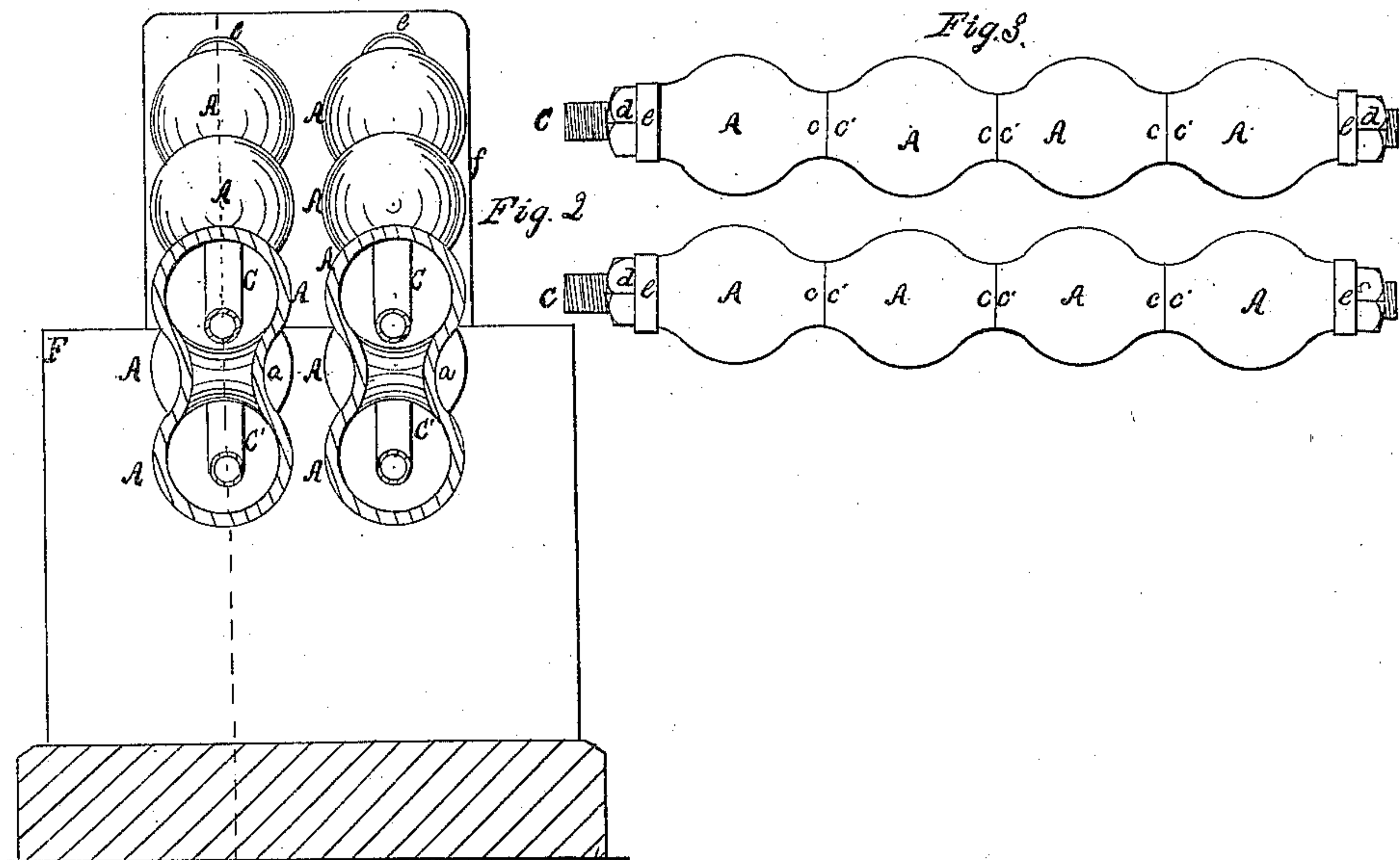
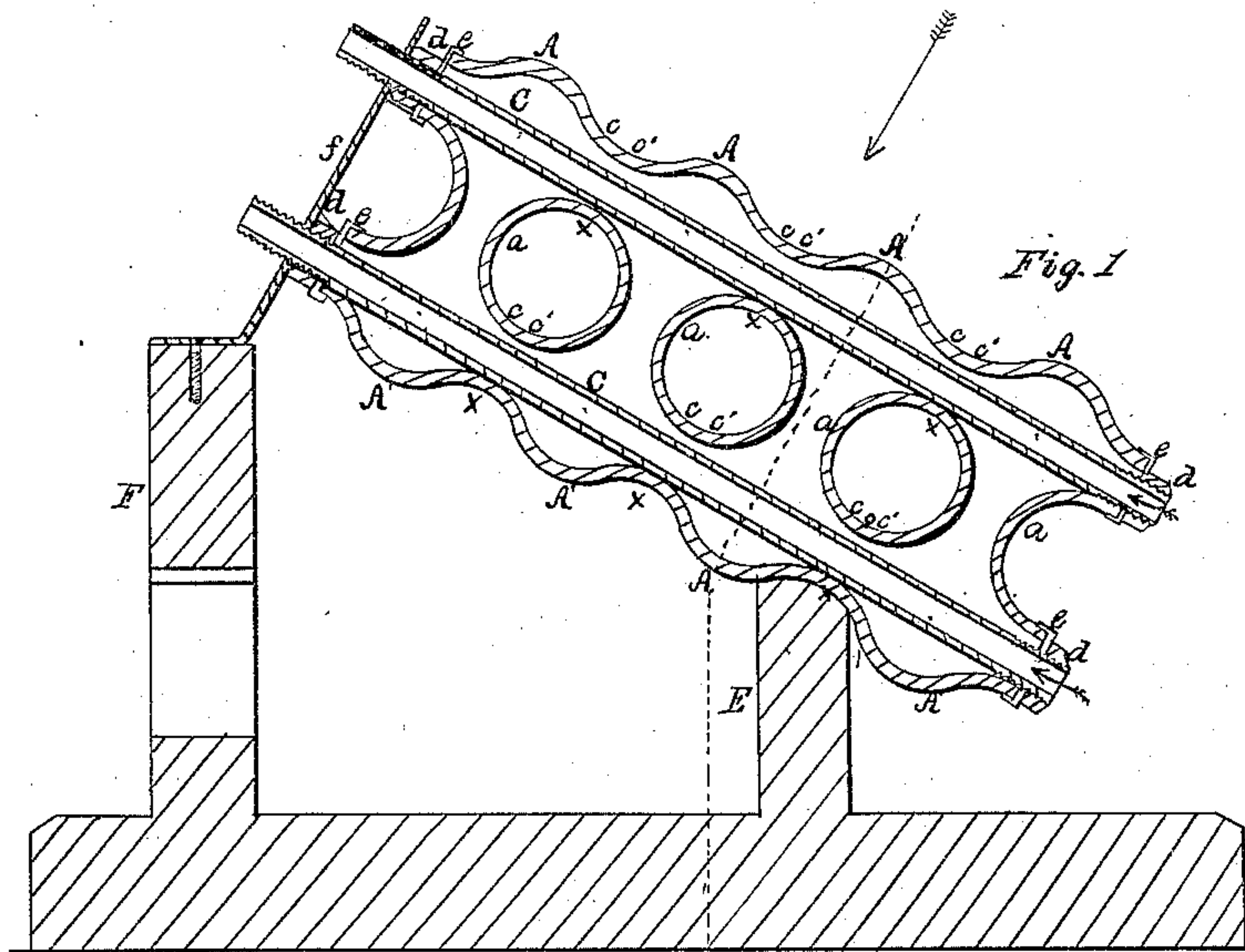


M. Foreman,
Sectional Steam Boiler.
N^o 58,802. Patented Oct. 16, 1866.



Witnesses

Wm. Albert Steel.
John Parker

Inventor

M. Foreman
By his Atty
H. Howson

UNITED STATES PATENT OFFICE.

M. FOREMAN, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. 58,802, dated October 16, 1866.

To all whom it may concern:

Be it known that I, MILTON FOREMAN, of Philadelphia, Pennsylvania, have invented certain Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to certain improvements, fully described hereinafter, in the steam-boiler for which Letters Patent of the United States were granted to Joseph Harrison, of Philadelphia, on the 4th day of October, 1859.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation.

On reference to the accompanying drawings, which form a part of this specification, Figure 1 is a sectional view of a portion of a Harrison boiler; Fig. 2, a transverse section on the line A B, Fig. 1; and Fig. 3, a plan view.

A A A A are hollow cast-iron spheres, which are permanently connected together, by hollow branches *a*, to similar spheres A'. From the opposite sides of each sphere project hollow branches *c c'*, and at the edge of each branch *c* is an annular projection, which fits into a recess in the edge of the branch *c'* of the adjacent sphere.

The spheres are bound firmly together by hollow bolts or tubes C C', which extend through the spheres and through the branches *c c'*, nuts *d*, which screw on the ends of the tubes, bearing on caps *e*, which cover the ends of outer branches, *c c'*. The tubes C C' are situated as near as possible to the lower sides of the branches *c c'*, as shown in the drawings, for a purpose described hereinafter.

One or more sections of a boiler, made by securing a series of spheres together, as above described, are arranged within a fire-place, as shown in the drawings, the lower end of each section resting on the wall E, while the outer ends of the tubes C C' project through a plate, *f*, secured to the front wall, F, of the fire-place.

In the boiler heretofore alluded to as pat-

ented by Joseph Harrison, the spheres are secured together by solid bolts, which extend through the centers of the spheres, and are provided at their ends with nuts, in the same manner as the tubes C. It has been found that when a boiler of this construction is subjected to a high heat, the bolts, which are of wrought-iron, expand to a greater degree than the cast-iron spheres. The latter, consequently, separate slightly at the joints *x*, through which the water escapes, the extent of the leakage increasing as the heat increases. As the boiler also is supported only at or near the ends, it has a tendency to sink in the center, the joints *x* being thus forced open at the lower edges, so that the leakage is increased.

When tubular bolts are substituted for solid bolts, the draft causes a constant current of cold air to pass through each tube in the direction of the arrows, the excessive heating and expansion of the tubes, the separating of the spheres, and escape of water being thus prevented, while the cold air which passes from the inner ends of the tubes C mixes with the heated gases from the fire-place and insures their thorough combustion.

By placing the tubular bolts as close as possible to the lower sides of the branches *c c'*, as shown in the drawings, the said bolts serve as girders to prevent the sinking of the spheres and opening of the joints at the lower edge. It will be apparent that currents of air may, if desired, be driven through the tubes C by means of suitable blowing apparatus.

I claim as my invention and desire to secure by Letters Patent—

1. The tubular bolts C, combined with and adapted to the system of spheres A, substantially as and for the purpose herein set forth.
2. The manner described of arranging bolts in respect to the spheres, so as to prevent the sinking of the same.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

M. FOREMAN.

Witnesses:

CHARLES E. FOSTER,
JOHN WHITE.