

No. 621,437.

Patented Mar. 21, 1899.

J. J. TONKIN.
STEAM BOILER.

(Application filed Sept. 3, 1898.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 2.

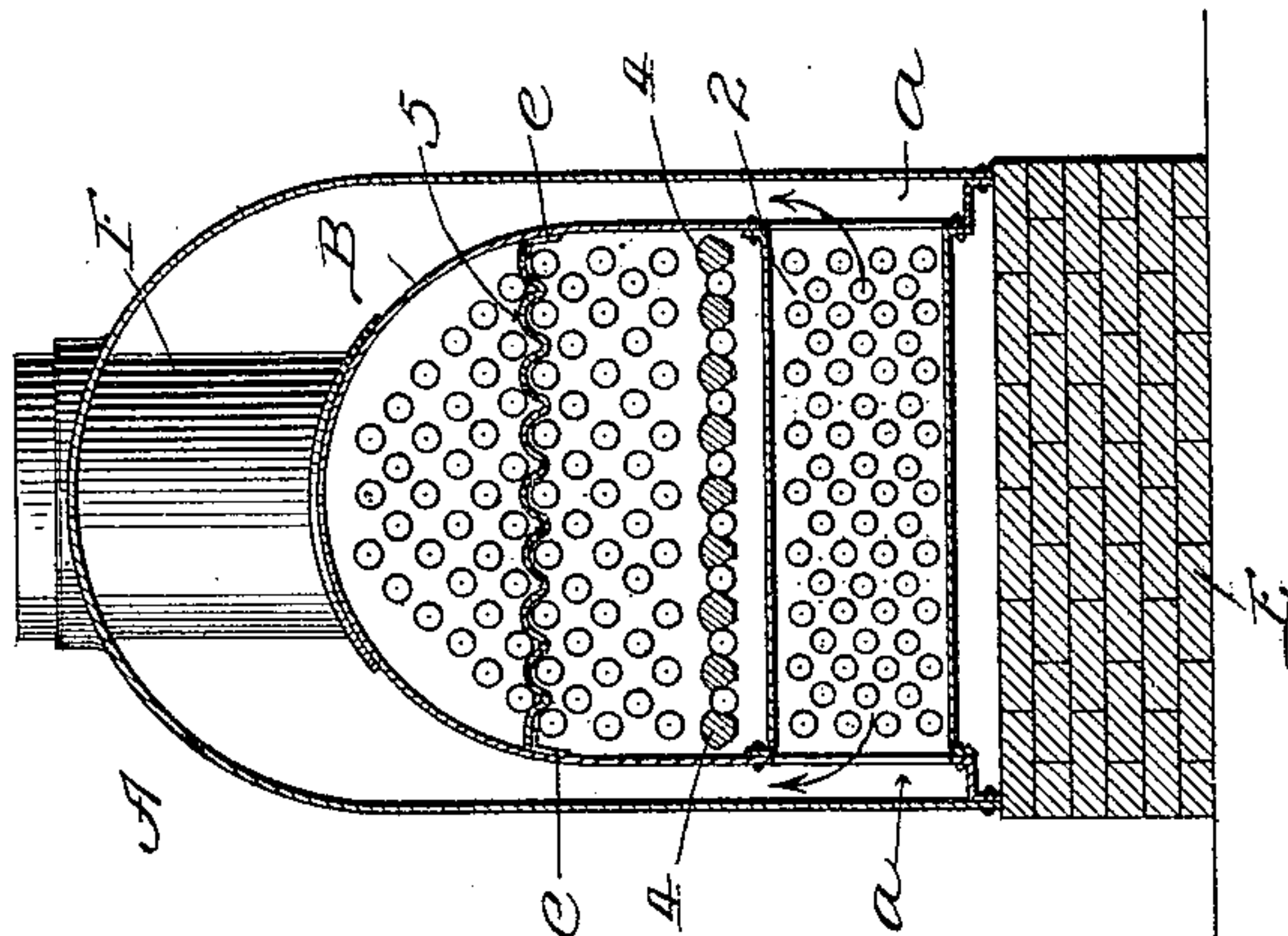
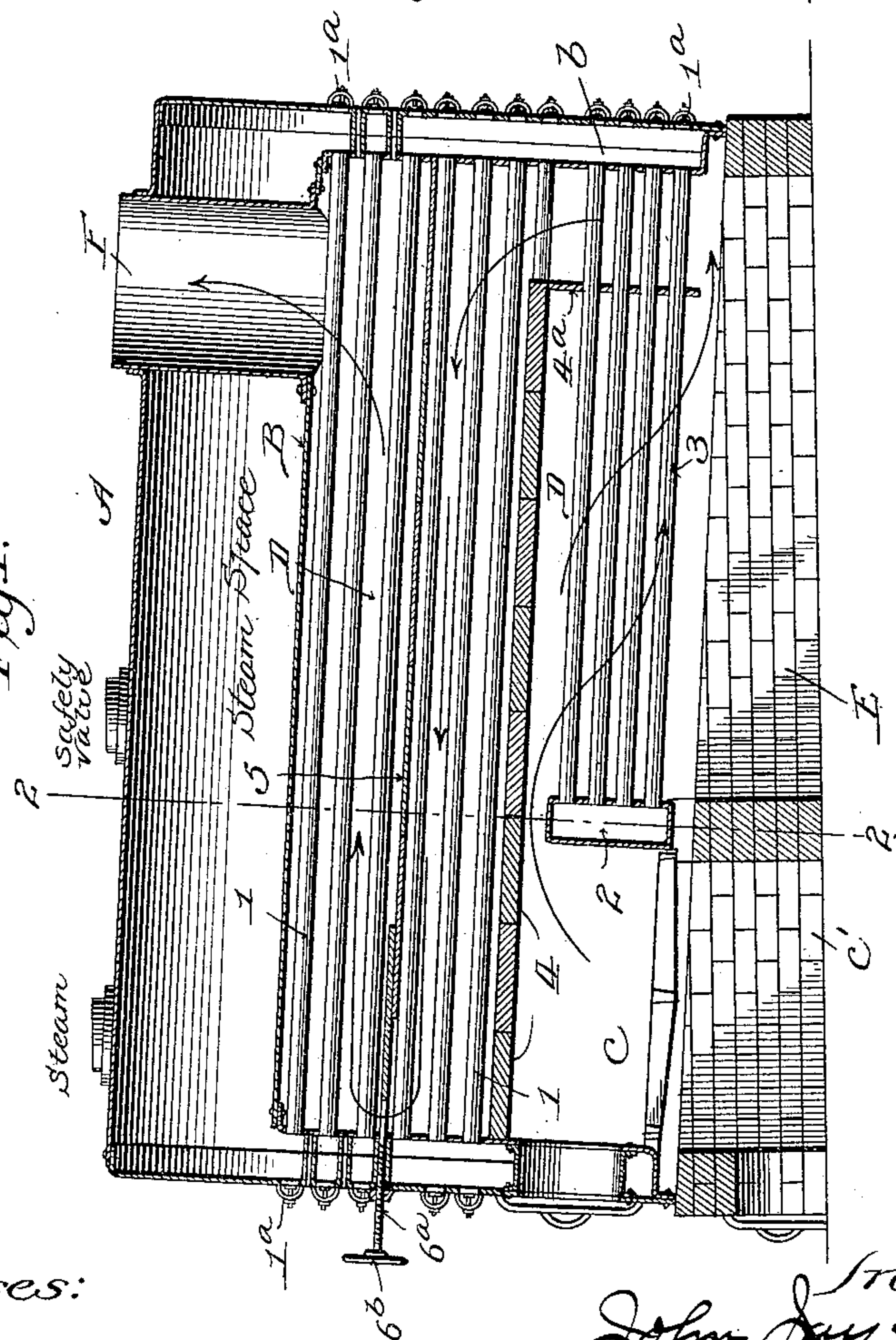


Fig. 1.



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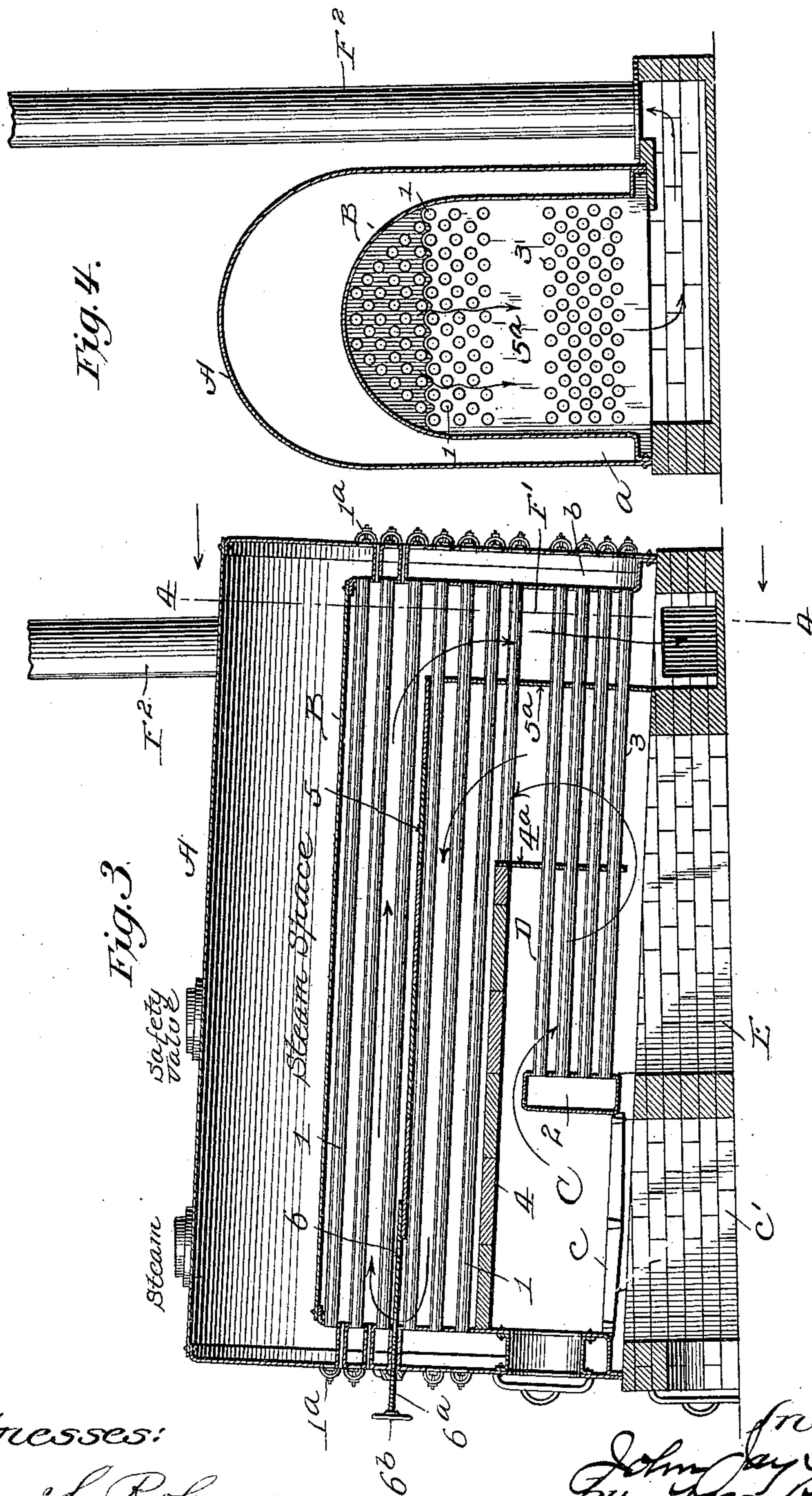
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Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN J. TONKIN, OF OSWEGO, NEW YORK, ASSIGNOR TO JOHN EATON, OF PITTSBURG, PENNSYLVANIA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 621,437, dated March 21, 1899.

Application filed September 3, 1898. Serial No. 690,172. (No model.)

To all whom it may concern:

Be it known that I, JOHN JAY TONKIN, a citizen of the United States, residing at Oswego, in the county of Oswego, State of New York, have invented certain new and useful Improvements in Steam-Boilers; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal central section of a steam-boiler embodying my invention. Fig. 2 is a transverse section thereof, taken on the line 2 2, Fig. 1. Fig. 3 is a longitudinal central section of a modification of the steam-boiler illustrated in Fig. 1; and Fig. 4 is a transverse section of the modification, taken on the line 4 4, Fig. 3.

Like symbols refer to like parts wherever they occur.

My invention relates to the construction of that class of steam-boilers having an included fire and combustion chamber, commonly termed "internally-fired" boilers, and has for its several objects to improve the circulation, to minimize the loss by radiation, and obtain the maximum absorption-surface for a boiler of given size.

To the above ends the main feature of my invention, generally stated, embraces the combination, with an open-bottom boiler, of an included water-chamber constituting a bridge-wall, with which and a water-leg of the boiler a series of water-tubes communicate, and one or more deflecting-partitions whereby the products of combustion from the fire-chamber are caused to dip and circulate around and between said water-tubes.

A second feature of my invention embraces the combination, with an included fire and combustion chamber boiler having a series of water-tubes traversing the included combustion-chamber, of a plurality of horizontally-extending deflecting-partitions, one or more of said partitions having a pendent section whereby the products of combustion are caused to dip or descend after leaving the included fire-chamber and before escaping from the combustion-chamber.

A third feature of my invention embraces

the combination, with an included-combustion-chamber boiler having a series of water-tubes traversing the combustion-chamber, of a plurality of deflecting-partitions within the combustion-chamber and a sliding section or baffle-plate arranged to control the throat or passage of one of said deflecting-partitions.

There are other minor features of invention, all as will hereinafter more fully appear.

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

In the drawings, A indicates the outer or main shell, and B the inner shell, the latter inclosing the fire-chamber C and combustion-chamber D, both of said shells extended down to the brickwork or foundation E upon which the boiler rests, so as to constitute an open-bottom boiler having continuous or connected water-legs on all sides. Traversing the combustion-chamber longitudinally and connecting the heads of the inner shell B are a series of water-tubes 1, to which access may be had through hand-holes 1^a in the main shell A for purposes of removing scale or deposit therefrom. Below the same and within the space included in shell B is a transverse water-chamber or hollow bridge-wall 2, preferably of boiler-plate, and connected with the inner shell B of the boiler, so that the water-space thereof communicates at its ends (see Fig. 2) with the lateral water-legs *a a* of the boiler. This hollow bridge-wall 2 divides the space within shell B into the fire-chamber C and the combustion-chamber D, the former provided with a suitable grate *c* and ash-pit *c'* and the latter divided up by a series of partitions which deflect the products of combustion. A series of water-tubes 3 connect the rear of the bridge-wall with the rear water-leg *b* of the boiler, and said bridge-wall 2 and water-tubes 3 serve to brace and strengthen the boiler and prevent injury to the inner shell from expansion and contraction.

The combustion-chamber D within the shell B, above the fire-chamber, is divided by one or more (preferably a plurality of) horizontal partitions sufficiently shorter than the inner shell B to allow of throats or passages for the products of combustion, and at least one of

said partitions is provided with a pendent or vertical section, which extends below the bridge-wall 2 and causes the products of combustion to dip among the water-tubes 3, which
 5 connect the bridge-wall 2 with the rear water-leg *b* of the boiler. 4 indicates the lower of said horizontal partitions, which extends from the fire-chamber end of the inner shell B to a point beyond the bridge-wall 2, where it terminates in a pendent section 4^a, which extends down to a point just below the lowest of the series of water-tubes 3. As this partition 4 is directly over the fire-chamber and subjected to the greatest heat, it is preferably
 15 constructed of a series of fire-brick tile or fire-brick sections of such shape as to be supported upon the lower row of water-tubes 2, which connect the heads of inner shell B; but the pendant 4^a may be of metal, perforated
 20 for the passage of the water-tubes 3, and thus while supported by said water-tubes it will in turn serve to support and brace the same. Where a second or upper horizontal deflecting-partition 5 is employed, being distant from
 25 the fire-chamber, it may be constructed of a series of transverse sections of corrugated cast-iron, (see Fig. 2,) supported by angle-plates or brackets *c* on the interior of inner shell B.

30 Where it is desired to mount the smoke-stack on the boiler, (see Figs. 1 and 2,) the usual openings will of course be provided in the inner shell B and outer shell A and connected by the flue-section F, and in such constructions the upper or second partition 5 will extend forward from the rear inner wall of the combustion-chamber and terminate somewhat short of the forward wall; but in case
 35 it is desired to employ a separate stack (see Figs. 3 and 4) the upper horizontal partition 5 will start at such a distance from the front wall of the inner shell B as to leave a throat or passage for the products of combustion and will stop short of the rear wall of the inner
 45 shell, terminating in a pendent partition 5^a, which will be perforated for the passage of the water-tubes 3 and will extend down below the pendant 4^a, resting upon a brick or other suitable cross-wall, so as to form a descending flue F', leading to the stack F².
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6 indicates a loose section of the upper partition or a baffle-plate, arranged to slide on said partition and provided with a threaded rod 6^a and hand-wheel 6^b or equivalent means of moving the baffle-plate back and forth to increase or decrease the area of the throat through which the products of combustion pass in order to confine the products of combustion within the shell B or to force the draft of the
 60 boiler, as circumstances may require.

The construction of my improved steam-boiler being substantially as hereinbefore pointed out, the products of combustion escaping over the bridge-wall 2 will first pass
 65 downward and backward among the water-tubes 3, which connect the hollow bridge-wall with the rear water-leg *b* of the boiler, the hori-

zontal partition 4 confining the products of combustion to the plane of the lateral water-legs *a a* below the line of water-tubes 1 and the pendant 4^a compelling the products to dip among the water-tubes 3. Escaping through the passage or throat at the rear end of partition 4 the products of combustion will rise and pass forward over partition 4 and below partition 5, absorbing heat from partition 4 and radiating heat to the lower rows of water-tubes 3 and the lateral walls of the boiler and, passing through the throat at the forward end of horizontal deflecting-partition 5, will finally
 75 pass backward around the upper series of water-tubes 1 below the steam-space of the boiler and escape into the stack or the flue leading to the stack.

Among the advantages derived from the improved construction herein set forth are the increased travel of the products of combustion within the shell and the ability to confine the heated products and cause them to impinge on the water-legs as well as on the water-tubes, whereby the heat of the products of combustion can be fully utilized before they are allowed to escape from the included combustion-chamber, the greatly-increased water-surface obtained without a proportionate increase in the proportions of the boiler, and the simplicity and greatly-strengthened construction due to the arrangement of the water-bridge and water-tubes connected therewith and with the rear water-leg of the boiler.
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Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an internally-fired open-bottom steam-boiler, having an outer shell and an inner shell extending down and constituting continuous water-legs, and a series of water-tubes which traverse the combustion-chamber and connect the heads of the inner shell, the combination therewith of a transverse hollow bridge-wall below said water-tubes and which communicates with the lateral water-legs of the boiler, and a series of water-tubes which connect the hollow bridge-wall with the rear water-leg of the boiler, substantially as and for the purposes specified.
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2. In an internally-fired open-bottom steam-boiler having an outer shell and an inner shell extending down and constituting continuous water-legs, and a series of water-tubes which traverse the combustion-chamber and connect the heads of the inner shell, the combination therewith of a transverse hollow bridge-wall below said water-tubes and which communicates with the lateral legs of the boiler, a series of water-tubes which connect the hollow bridge-wall with the rear water-leg of the boiler, and one or more horizontal partitions arranged in the combustion-chamber above the bridge-wall, substantially as and for the purposes specified.
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3. In an internally-fired steam-boiler, the combination of an outer shell, an inner shell having its heads connected by water-tubes,

a hollow bridge-wall which communicates with the lateral water-legs of the boiler, water-tubes which connect the hollow bridge-wall with the rear water-leg of the boiler, and
5 suitable deflecting-partitions arranged within the included combustion-chamber of the boiler, substantially as and for the purposes specified.

4. In an internally-fired steam-boiler, the
10 combination with an outer shell and an inner shell, the latter having its heads connected by water-tubes, of a hollow bridge-wall which communicates with the lateral legs of the boiler, a series of water-tubes which connect
15 the hollow bridge-wall with the rear water-leg of the boiler, and a horizontal partition having a pendant which extends below the bridge-wall, substantially as and for the purposes specified.

20 5. The combination with a steam-boiler having lateral water-legs, and a rear water-leg, of a transverse hollow bridge-wall which communicates with the lateral water-legs of

the boiler, a series of water-tubes which connect the hollow bridge-wall with the rear wa- 25
ter-leg of the boiler, and one or more horizontal deflecting-partitions provided with a pendant section which extends below the top of the bridge-wall, substantially as and for the purposes specified.

6. The combination with an internally-fired steam-boiler having water-tubes which traverse the included combustion-chamber, of a plurality of horizontal deflecting-partitions arranged within the combustion-chamber, one 30
or more of said deflecting-partitions having pendant sections, substantially as and for the purposes specified. 35

In testimony whereof I affix my signature, in presence of two witnesses, this 29th day of 40
August, 1898.

JOHN J. TONKIN.

Witnesses:

LAURON INGELS,
W. L. MURRAY.