

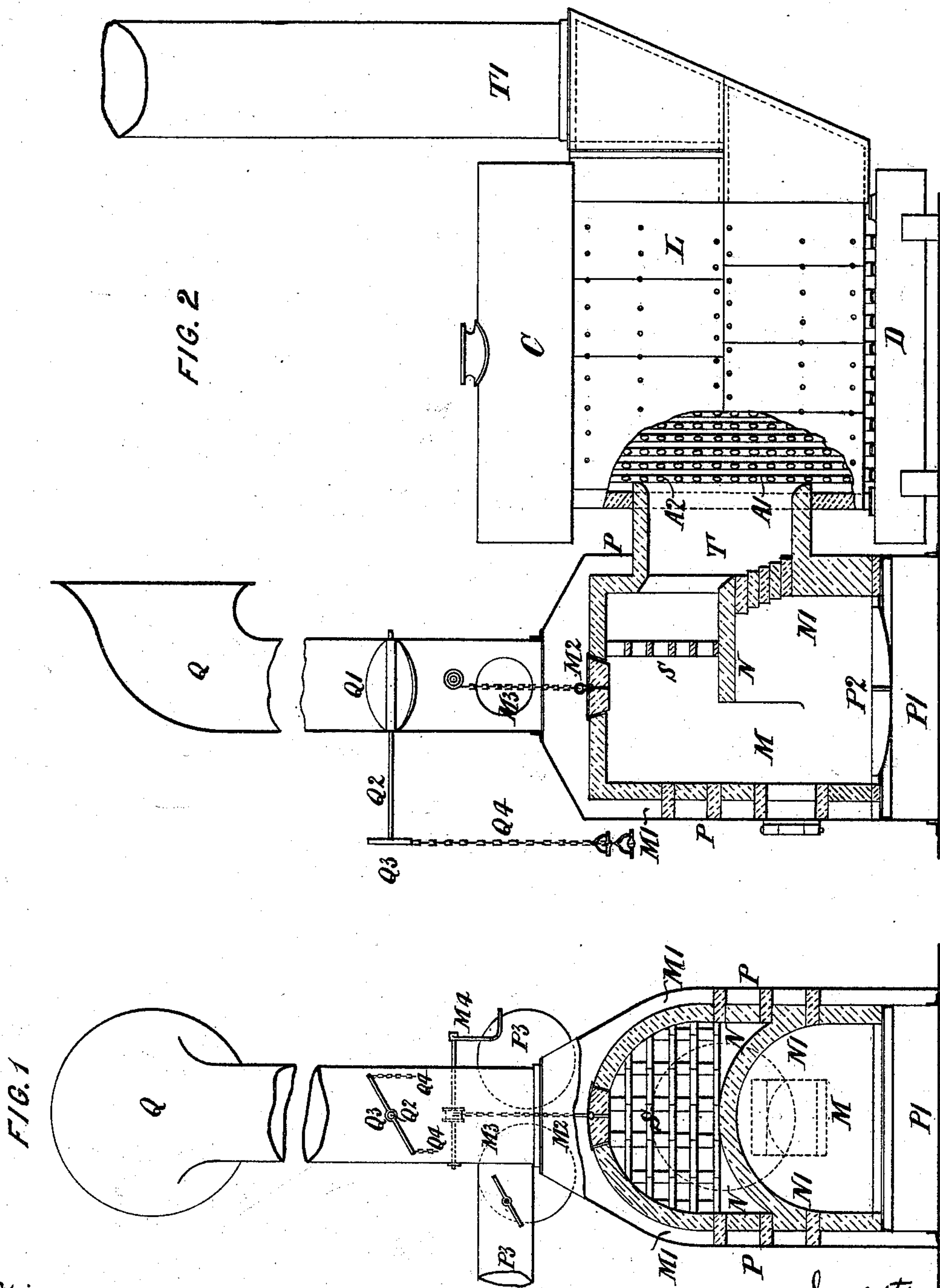
(No Model.)

2 Sheets—Sheet 1.

S. ALLEY.
STEAM BOILER.

No. 561,469.

Patented June 2, 1896.



Witnesses:
Louis Menke
A. C. Connor

Inventor
Stephen Alley
By his Attorneys
Howson & Howson

(No Model.)

2 Sheets—Sheet 2.

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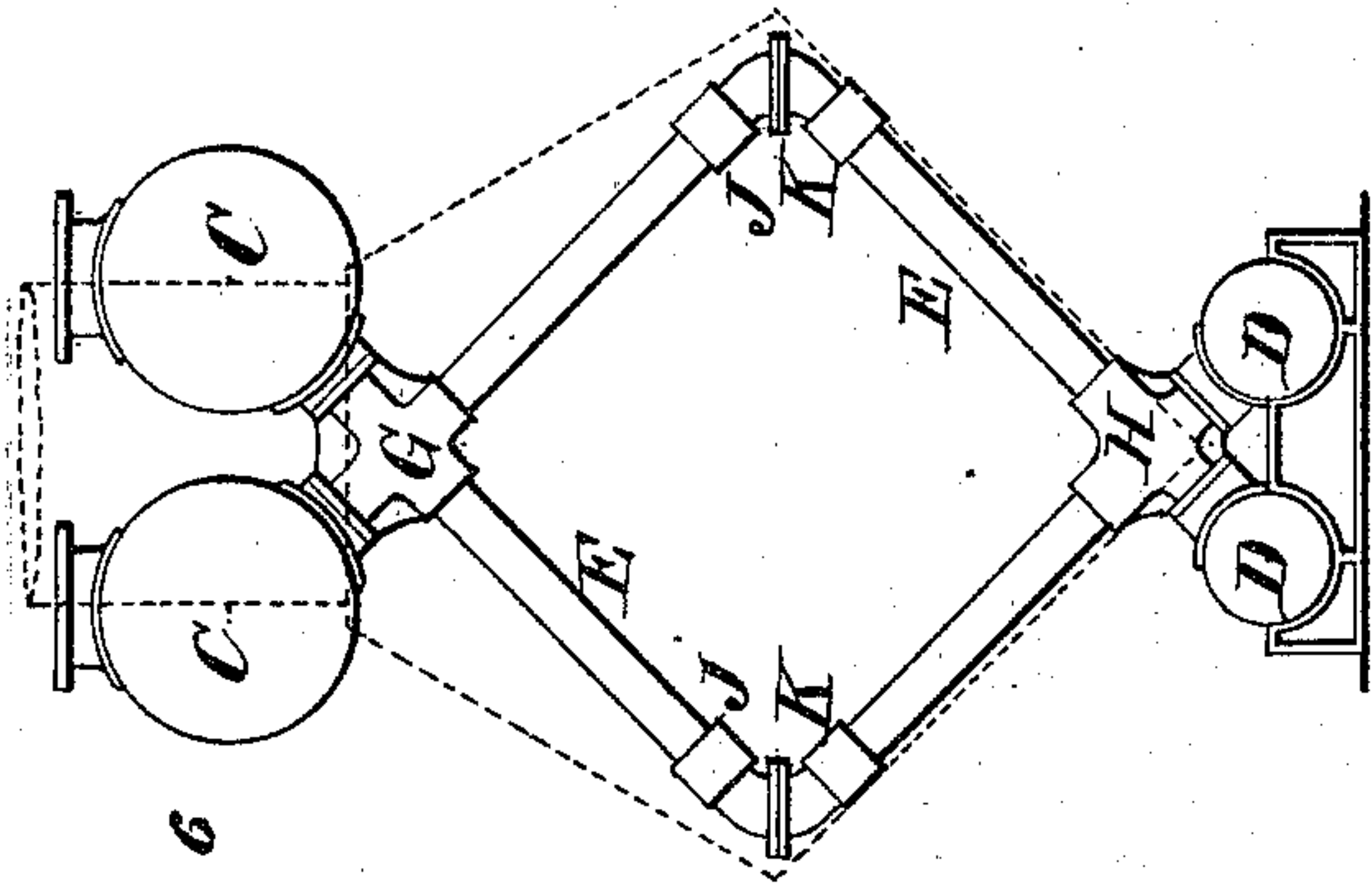


FIG. 6

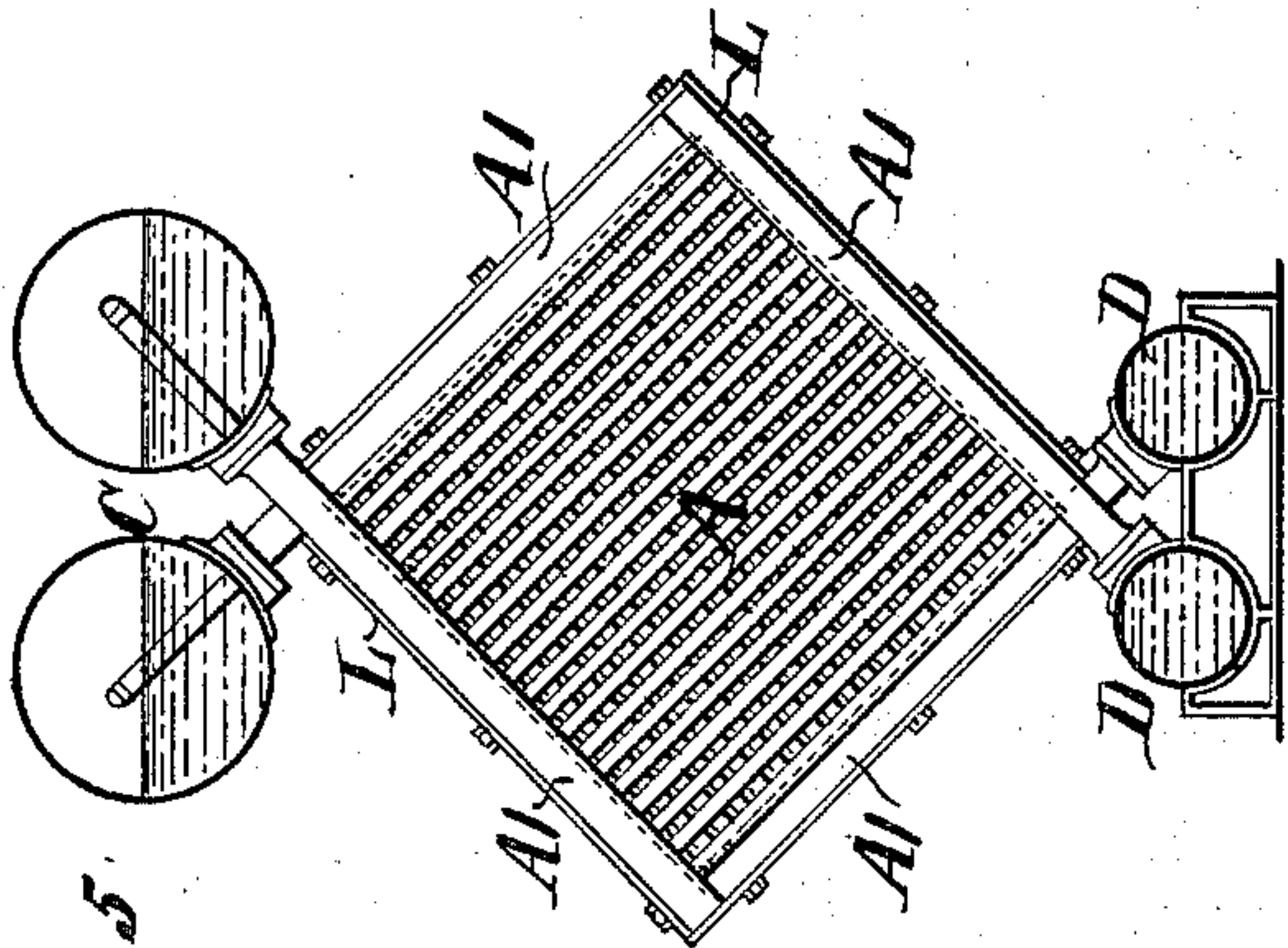


FIG. 5

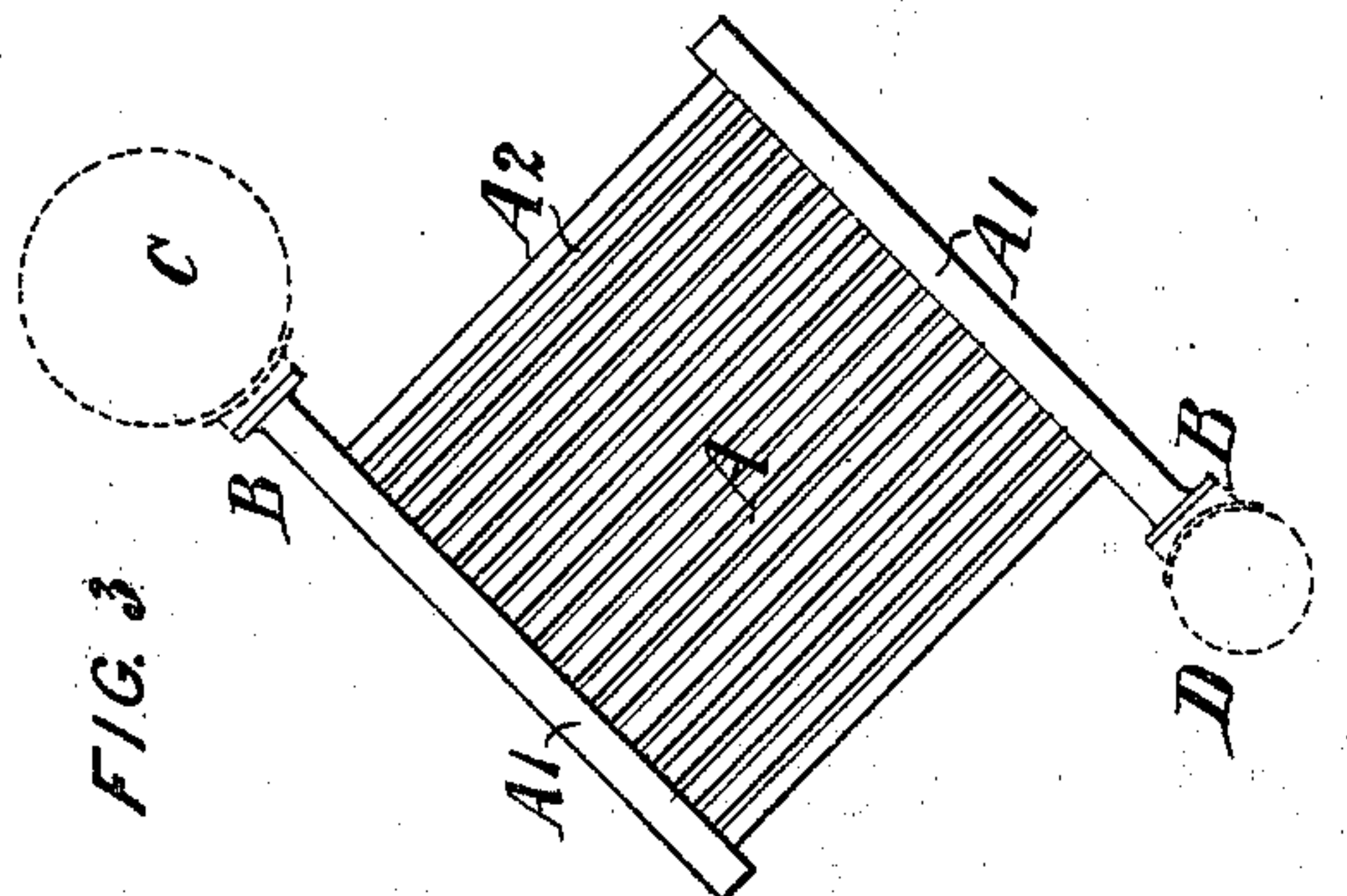


FIG. 3

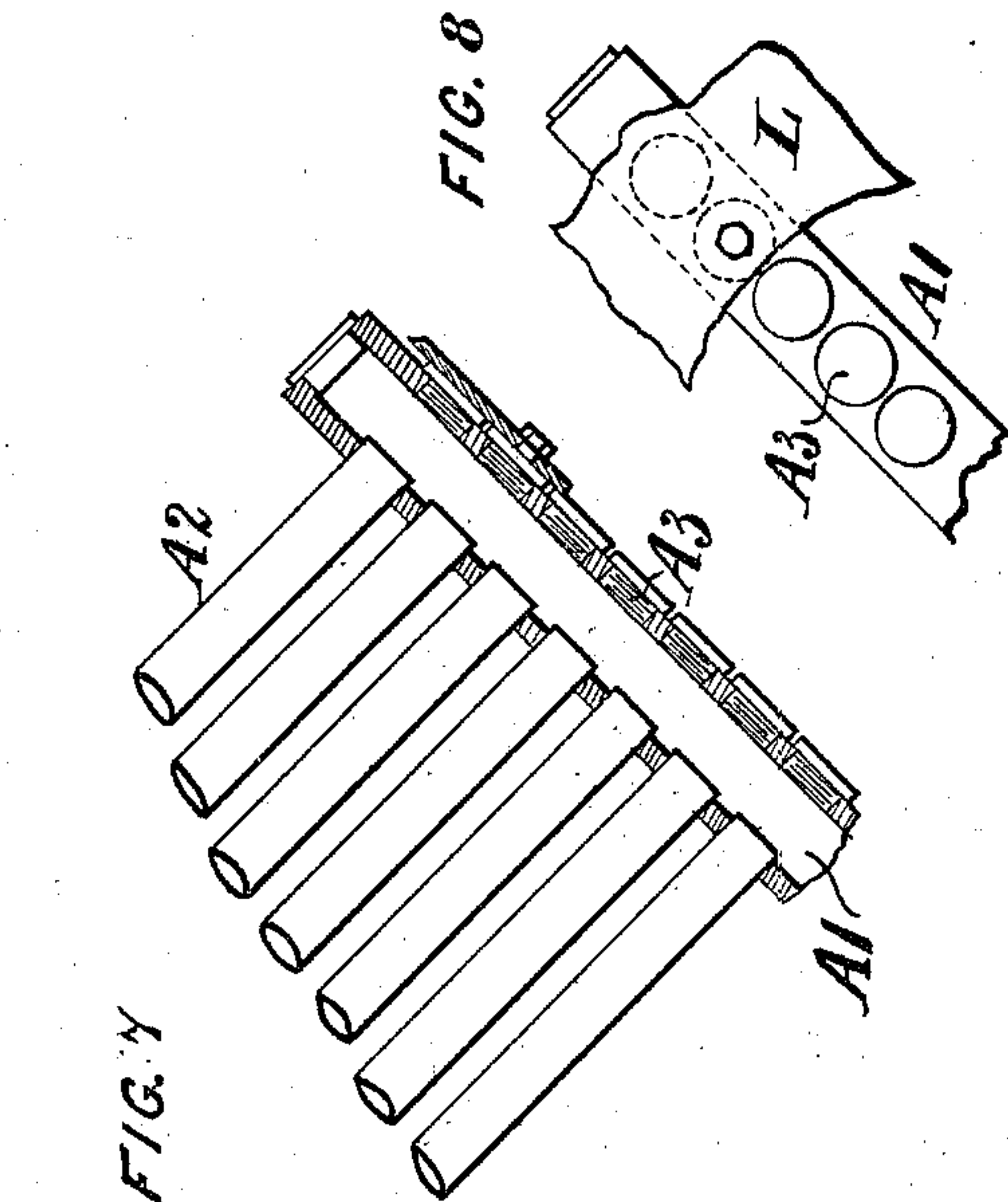


FIG. 4

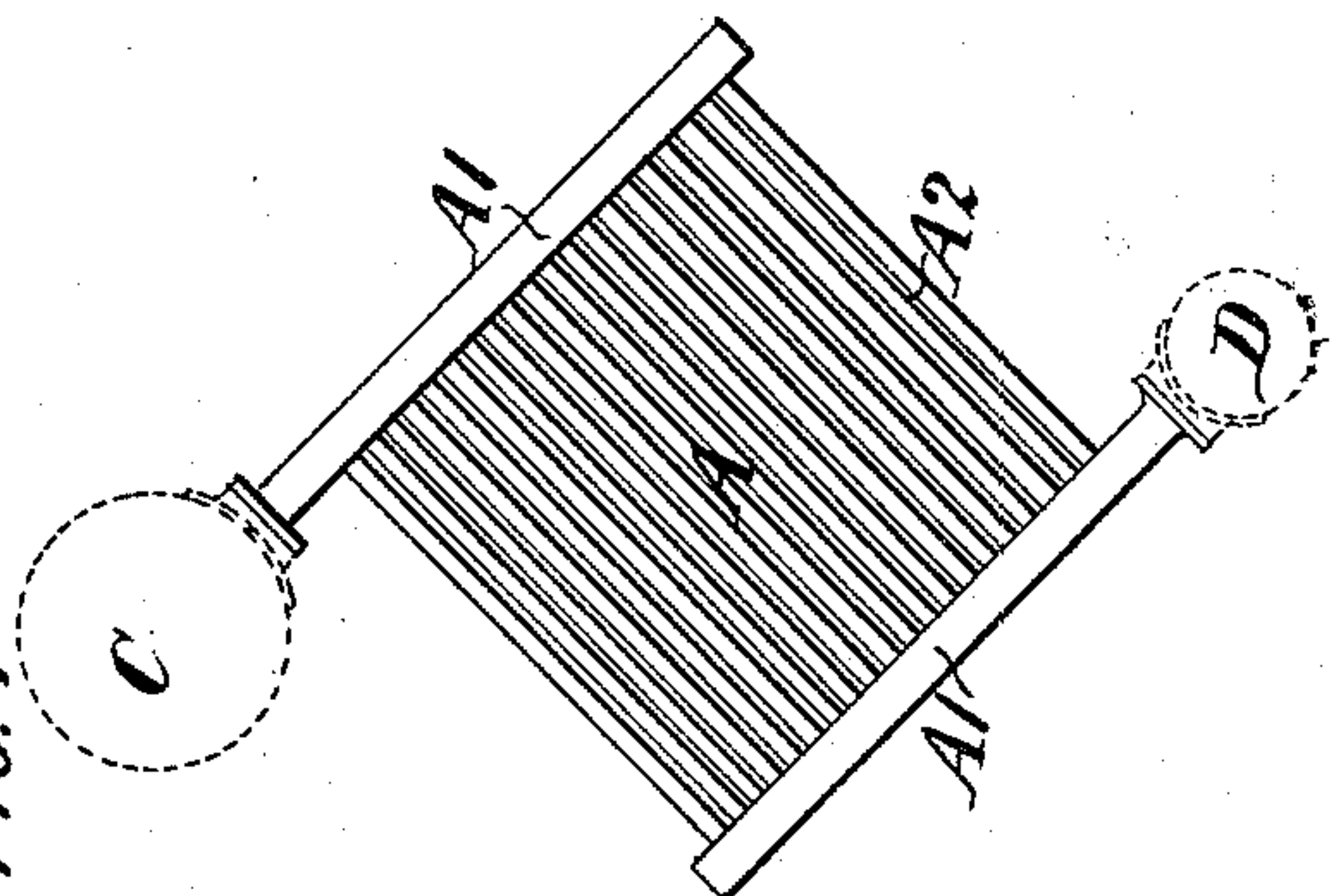


FIG. 7

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UNITED STATES PATENT OFFICE.

STEPHEN ALLEY, OF GLASGOW, SCOTLAND.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 561,469, dated June 2, 1896.

Application filed April 11, 1896. Serial No. 587,139. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN ALLEY, a subject of the Queen of Great Britain and Ireland, and a resident of Glasgow, Scotland, have
5 invented certain Improvements in Steam-Boilers, of which the following is a specification.

My said invention has for its object to construct steam-boilers (especially such as are
10 known as "water-tube" steam-boilers) in an improved manner, so that they will be less expensive to make and more efficient in practice, and so that their parts will be more accessible than heretofore for the purposes of
15 examination and repair.

A steam-boiler as made with my improvements is shown on two accompanying sheets of explanatory drawings.

Figures 1 and 2 on Sheet 1 thereof are respectively a transverse vertical section and a sectional side elevation. Figs. 3 and 4 on
20 Sheet 2 are elevations of separate tubular sections or elements of the improved boiler. Fig. 5 is an end elevation of the tubular sections or elements as combined together, with
25 other parts of the boiler in vertical section. Fig. 6 is an end elevation of certain parts of the boiler. Figs. 7 and 8 are enlarged views, at right angles to each other, of details.

30 In the drawings the same reference-letters are used to mark the same or like parts wherever they are repeated.

A boiler as made with my improvements consists, essentially, of elements or sections A,
35 comprising each two large tubes A', connected by smaller tubes A², so as to form a flat sheet of rectangular shape. The tubes of the several sheets or sections A are inclined and at right angles to each other and are placed
40 side by side, each upper large tube A' of them having its lower end blind and its other end bolted by a flange B to one of two upper steam-drums C, while each lower tube A' has its upper end blind and its lower end bolted
45 to one of two lower mud-drums D. The upper drums C and the lower drums D are horizontal and extend across the upper and lower ends of the tubes A'. Large tubes E for the downward flow of water to the lower
50 drums D are provided, these tubes being connected to upper and lower branch pipes G H for being bolted, respectively, to the upper and

lower drums C and D. The tubes E are also
jointed together at their other ends by coupling-pieces J and K in a manner to form a
55 frame similar in shape to the tubular sheets A, each tube E having a coupling-piece screwed to it, and the coupling-pieces being bolted together by means of flanges. The tubular sections A are inclosed by a casing L,
60 consisting, preferably, of two sheets of thin steel or other metal, with a sheet of asbestos or other suitable non-conducting material placed between them. The casing L is made in sections, which are fixed to the tubes A' in
65 a manner hereinafter described, so that any sheet of tubes can be gotten at for the purposes of examination or repair without disturbing the others.

The furnace M, which is external to the
70 boiler, is constructed of refractory material and of considerable height, with an arched roof and with an internal arch N projecting out from the bridge N' toward the middle of
75 the furnace in a manner to form a baffle for the fire-gases. The furnace M is inclosed by a metal casing P, to the upper part of which is fixed an air-conduit Q, with a flared top for natural draft and provided with a butterfly
80 valve or damper Q', adjustable by means of a rod Q², a lever Q³, and chains Q⁴ for controlling the supply of air. Between the walls of the furnace M and the metal casing P an
air-space M' is provided, with which the air-conduit Q and the ash-pit P' communicate
85 for the purpose of supplying air to the furnace through the fire-bars P². Fans P³ or other suitable apparatus are provided in connection with the air-conduit Q to supply
90 forced draft by the passage M' to the ash-pit P', and thence through the fire-bars P² to the furnace M. The air-conduit Q also communicates with the interior of the furnace M by means of an opening in the roof of the furnace closed by a disk-valve M², worked by a
95 chain M³, and a crank-shaft M⁴, turned in bearings in the air-conduit shell. With this construction the air passing between the outer shell P and the furnace-walls takes up and utilizes heat passing through those walls.
100

The fire-gases from the furnace M have their complete ignition secured by passing through brick checkerwork S in the space between the arched piece N and the roof of

the furnace, the checkerwork becoming intensely heated. The space N communicates by a short flue T with an opening in the casing L, inclosing the tubular sections A of the boiler. The fire-gases pass in contact with the component tubes of the tubular sections A, and finally escape to a funnel or chimney T' at the farther end of the boiler. The furnace M instead of being placed at the end of the boiler may be placed under or at either side of it.

The small tubes A² of the tubular sections A, connecting the larger tubes A', are expanded and properly beaded through openings in the outer sides of the large tubes, these openings being closed by screwed plugs A³, as shown in Figs. 7 and 8. In cases, however, where very small tubes are employed they may be brazed or otherwise fixed into the larger tubes A', and the openings closed by the screwed plugs A³ may be dispensed with. Some of the plugs A³ are made with central projections, which are screwed to form studs for fixing the sections of the casing L to the tubular sections A.

The tubes A' may be made large enough to have fixed to each more than one row of the tubes A², the tubes of one row being in that case placed opposite the spaces between the tubes of the other row.

In the improved boiler hereinbefore described each tubular section A may be detached without moving the others, and each individual tube can be removed and be replaced by another without disturbing the section it belongs to.

What I claim as my invention is—

1. In combination an external boiler-furnace of brickwork, an outer metal shell between which and the furnace-walls the air for combustion passes and is heated, a boiler-casing with which the furnace communicates and which incloses a series of sets of water-

tubes fixed in larger end tubes and forming rectangular frames or sections, the tubes of each section being at right angles to those of the adjacent sections, upper steam-drums and lower water-drums connected respectively to the highest and lowest parts of the sections of tubes, and separate pipe connections for the downward flow of the water substantially as hereinbefore described.

2. In combination an external boiler-furnace of brickwork, an outer metal shell between which and the furnace-walls the air for combustion passes and is heated, a baffle-arch extending over about half the lower part of the furnace, and above the arch checker-brickwork, for the passage and ignition of the fire-gases, on their way from the furnace to a series of vertical sections of water-tubes forming the boiler heating-surface, the tubes of each section being at right angles to those of the adjacent sections; and an outlet flue or chimney for the discharge of the spent fire-gases after they have traversed the series of water-tube sections or frames substantially as hereinbefore described.

3. In a steam-boiler the combination of sections or elements each made up of two straight and parallel large tubes connected by smaller straight tubes at right angles to the large tubes so as to form a flat rectangular sheet or frame the sections or elements being placed side by side with the tubes of one section at right angles to those of the other and bolted to upper and lower drums, and being in combination with an external furnace substantially as hereinbefore described.

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

STEPHEN ALLEY.

Witnesses:

EDMUND HUNT,
GEORGE PATTERSON.