

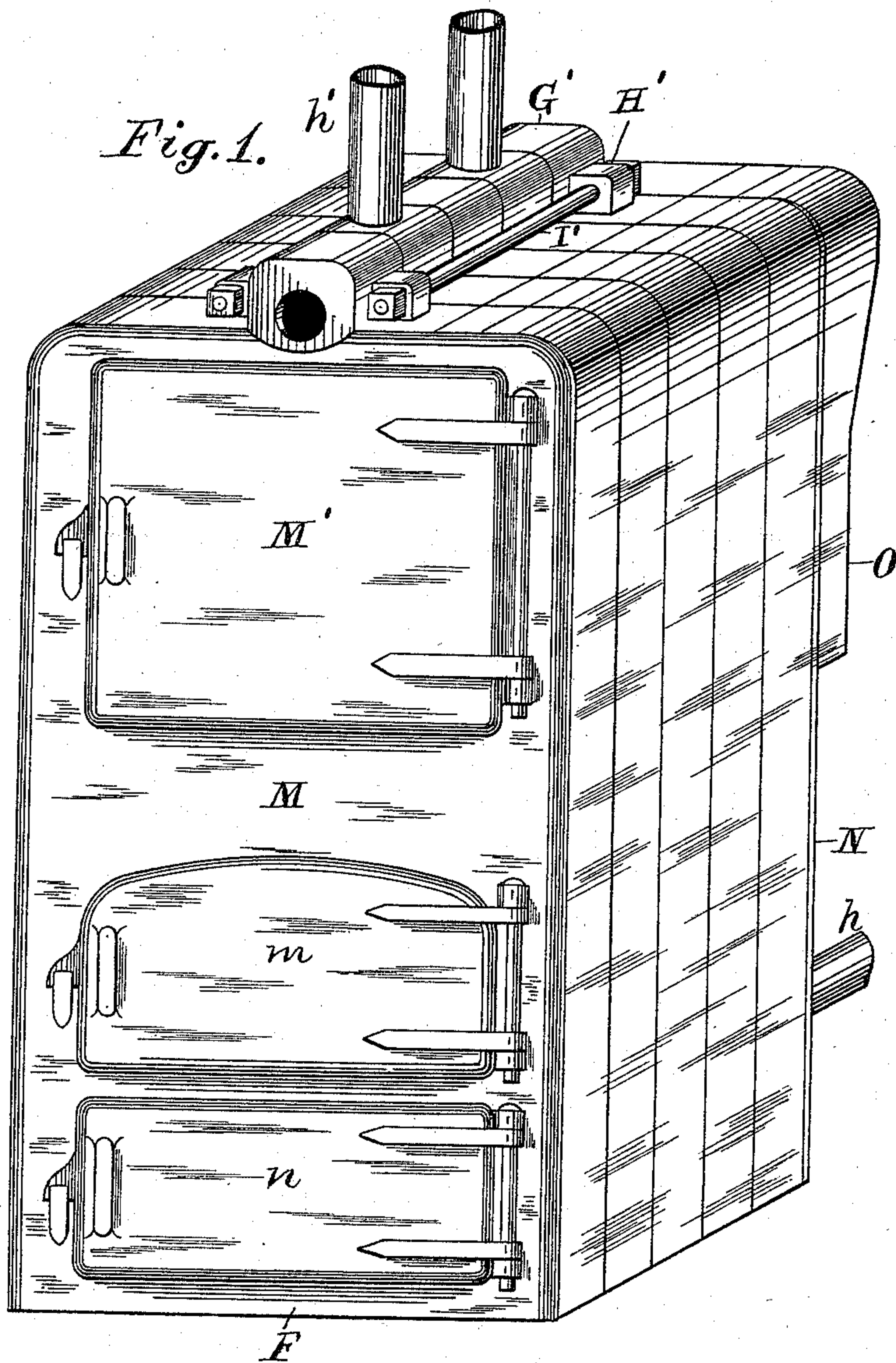
(No Model.)

J. J. BLACKMORE.  
STEAM OR HOT WATER BOILER.

3 Sheets—Sheet 1.

No. 580,364.

Patented Apr. 13, 1897.



Attest:  
L. Lee,  
Edw. F. Kinsey.

Inventor.  
Joseph J. Blackmore,  
per Thomas S. Crane, atty.

(No Model.)

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3 Sheets—Sheet 2.

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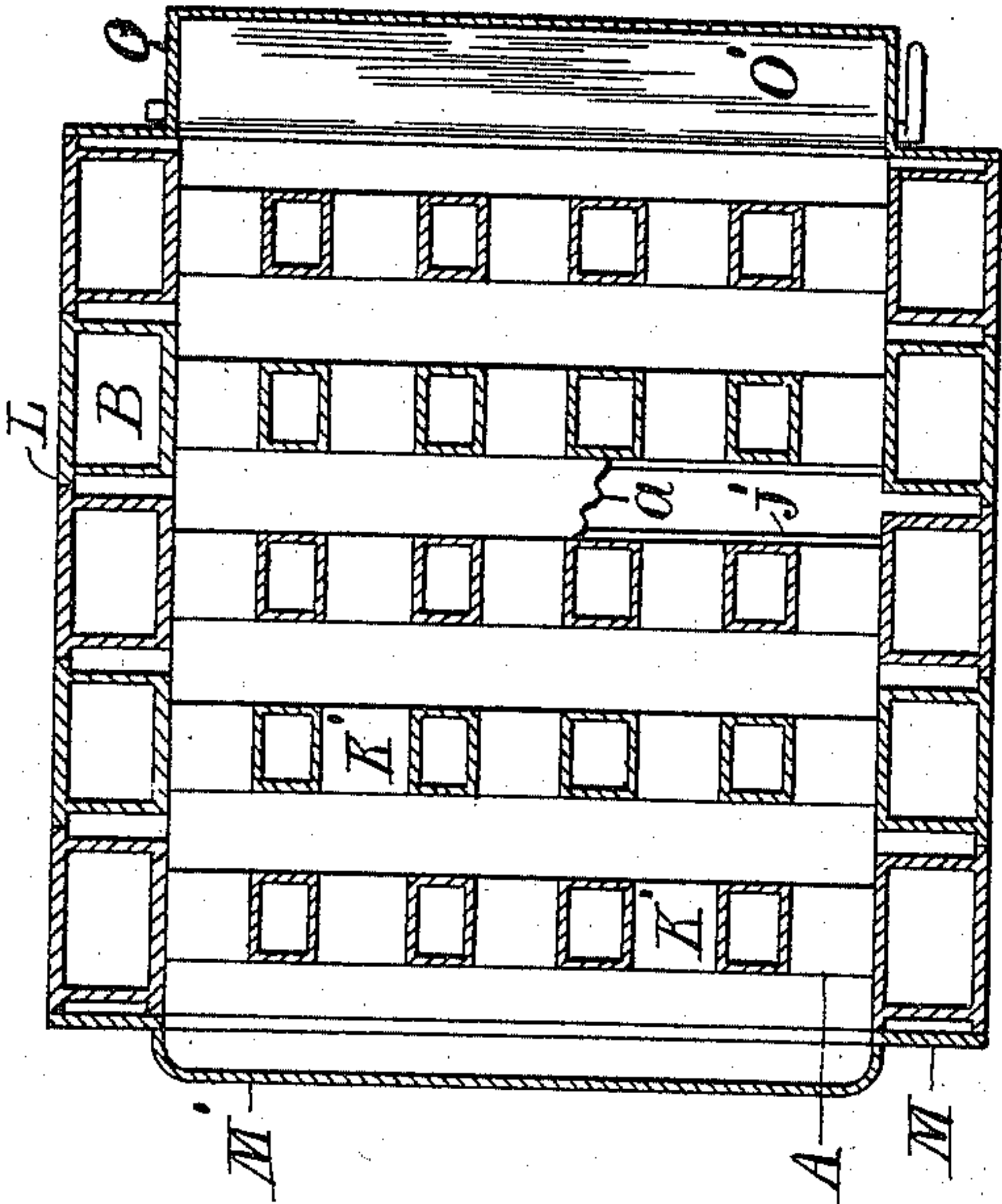


Fig. 3.

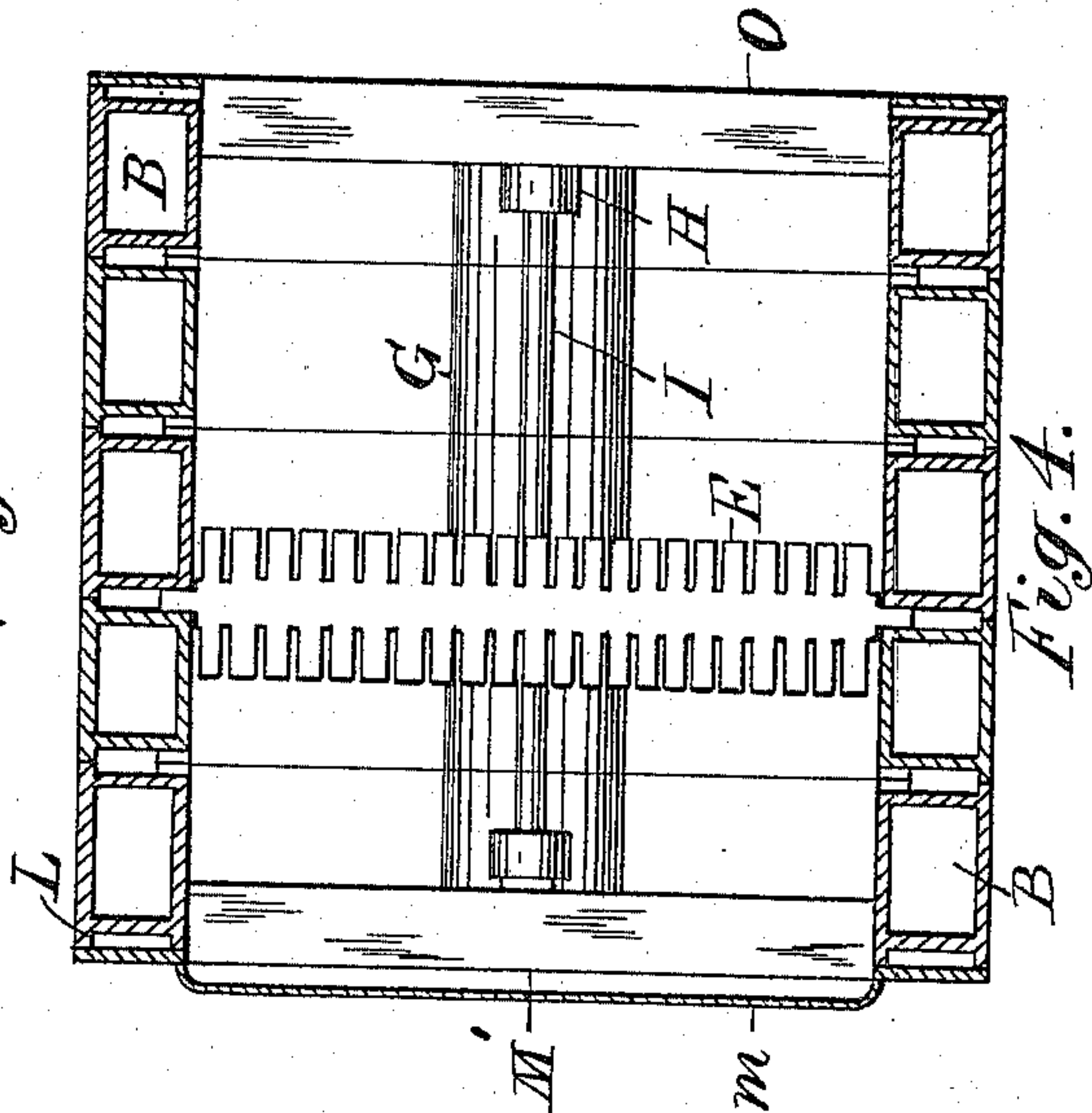


Fig. 4.

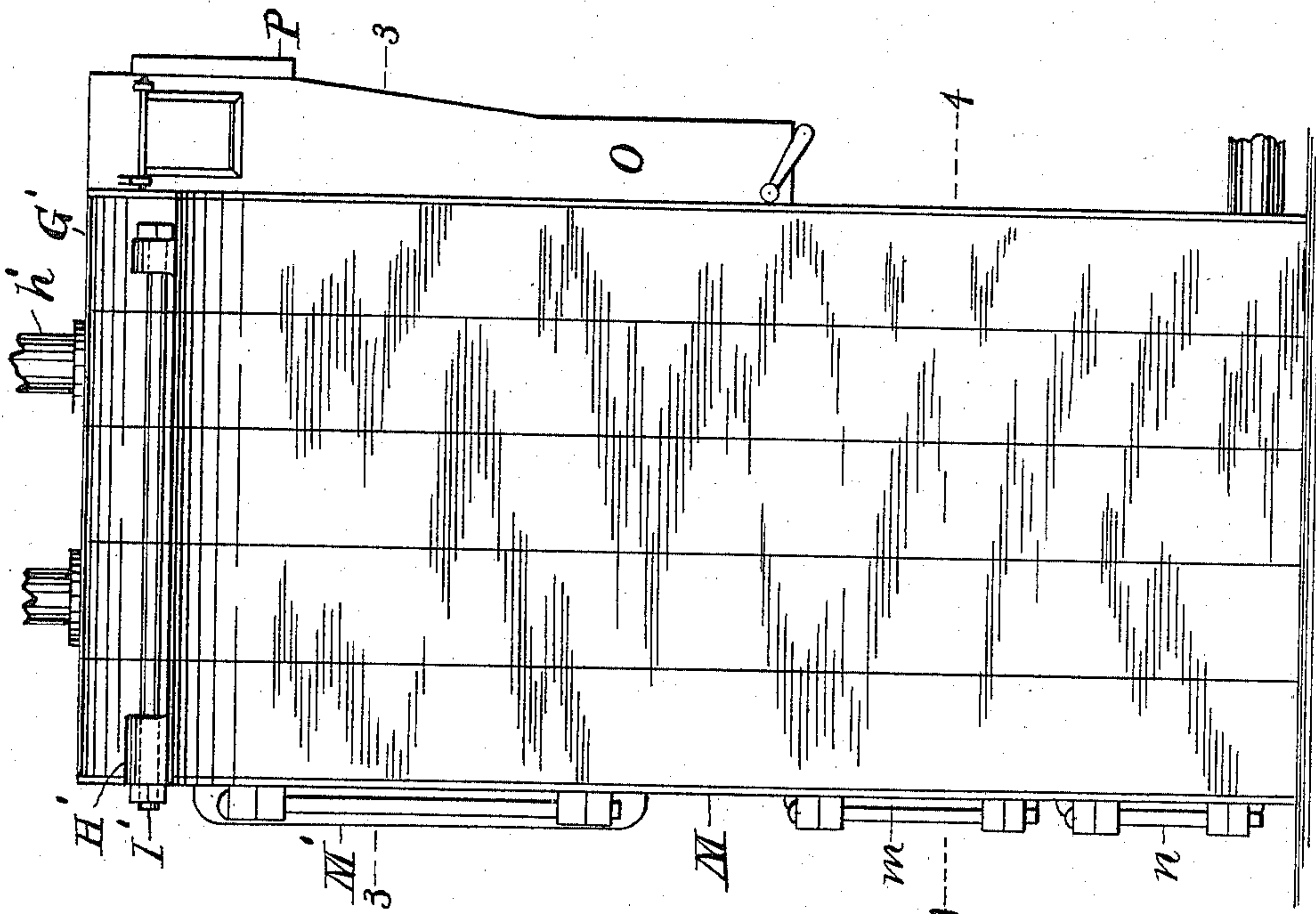


Fig. 2.

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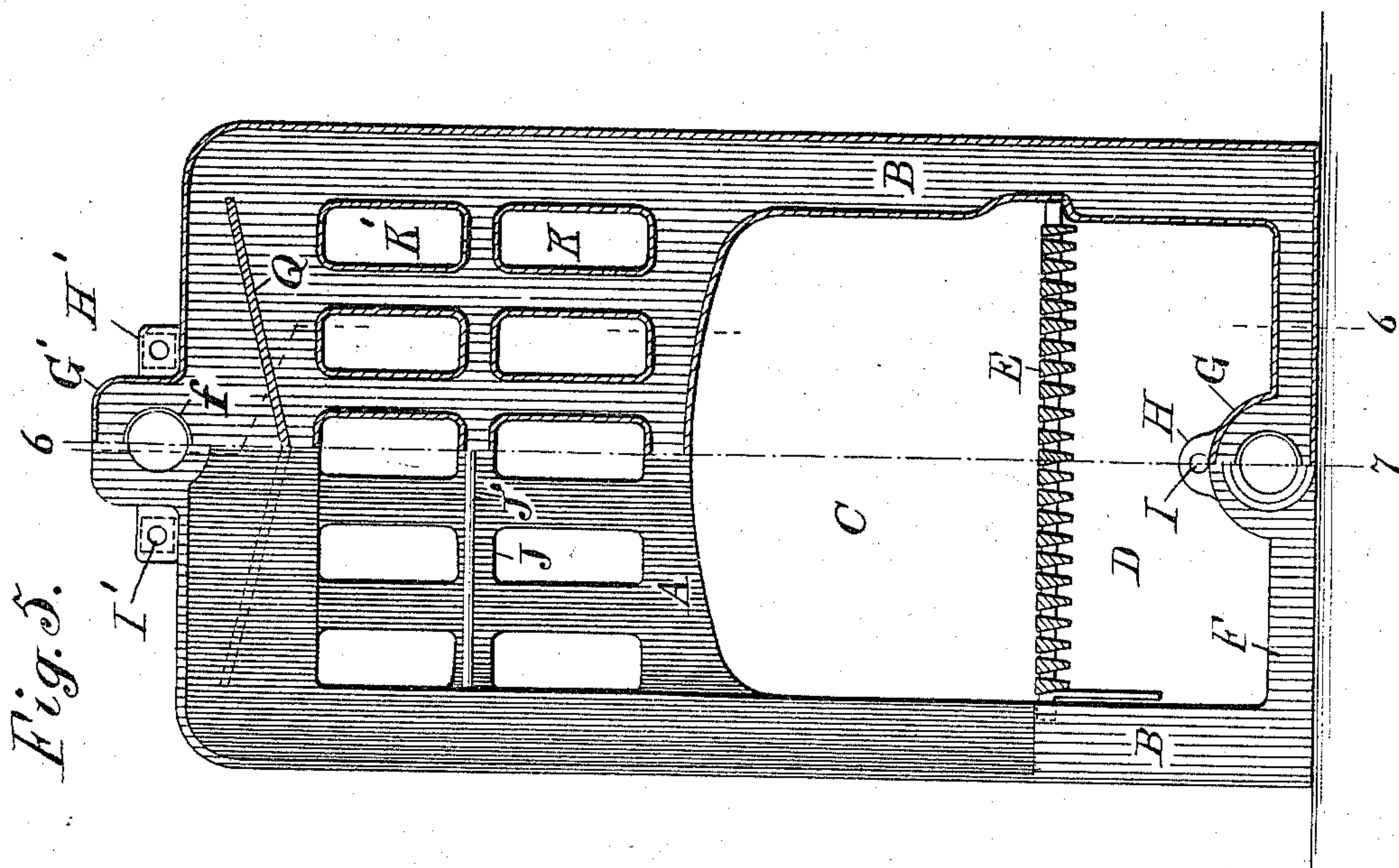
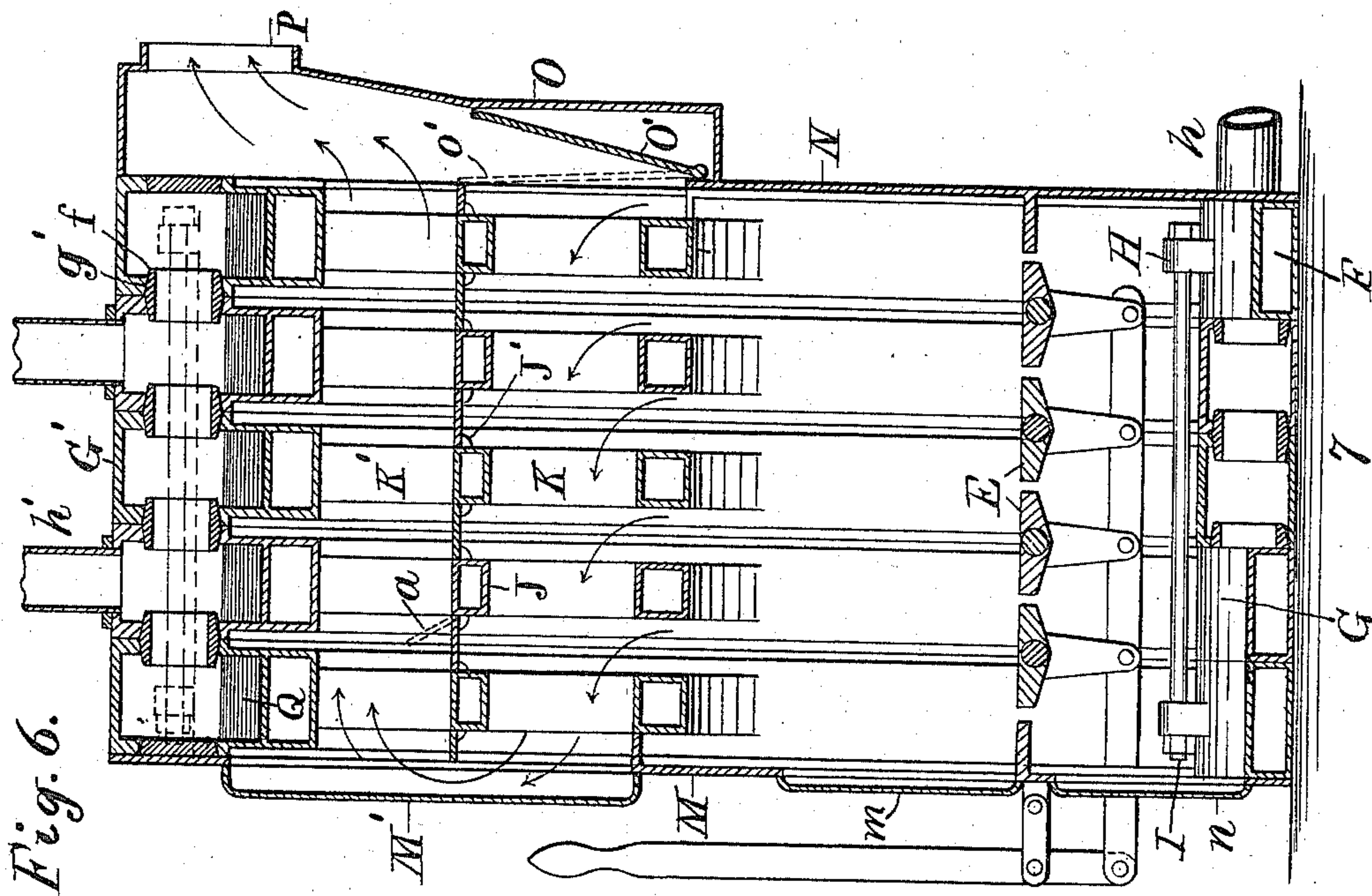
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3 Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

JOSEPH J. BLACKMORE, OF JERSEY CITY, NEW JERSEY.

## STEAM OR HOT-WATER BOILER.

SPECIFICATION forming part of Letters Patent No. 580,364, dated April 13, 1897.

Application filed July 18, 1896. Serial No. 599,658. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH J. BLACKMORE, a citizen of the United States, residing at Jersey City, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Steam or Hot-Water Boilers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 This invention relates to a boiler comprising a series of flat vertical sections each having flue-passages through the upper part and water-legs, with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar forming the bottom of the ash-box.

20 The top of the section and the horizontal water-bar are each provided with an upwardly-projecting chamber having upon its opposite faces coupling-sockets adapted to receive a suitable coupling to form continuous passages through the series of sections, which series are drawn together by bolts extended outside of the waterway and fitted to lugs upon the front and rear sections.

25 The body of the section above the fire-box is made of less thickness than the edges of the sections to permit the heated gases to circulate between the adjacent faces of the sections, and the margin of each section is preferably provided with a projecting rib to expose the edge portions of the sections also to the action of the gases.

35 The flue-passages are preferably formed as vertical slots through the body of the section, and such flue-passages are divided transversely, as well as the adjacent space between the bodies of the sections, to form direct and return flues.

40 A deflecting-plate, inclined upwardly from the middle toward the ends, is preferably formed within the top of the section below the coupling-sockets to direct the rising fluid to the sides of the section before it is discharged therefrom.

45 These improvements, with other details of construction, are shown in the annexed drawings, in which—

50 Figure 1 is a perspective elevation of the boiler. Fig. 2 is a side elevation of the same. Fig. 3 is a cross-section on line 3 3 in Fig. 2. Fig. 4 is a cross-section on line 4 4 in Fig. 2

with a single section of rocking grate exhibited. Fig. 5 is a front elevation of the boiler with the front plate removed and one-half of the section shown cut open where hatched, and Fig. 6 is a vertical sectional view taken partly on line 6 6 in Fig. 5 and partly where marked 7 in the margin of Fig. 6 upon the line 6 7 in Fig. 5. The two section-planes intersect the bottom of the ash-box at different points, the view on line 6 6 showing the rectangular shape of the water-bar, while the view on line 6 7 shows the interior of the water-chamber which is formed at the middle of such bar, with the couplings which are fitted to the adjacent faces.

A designates the body of the section; B, the water-legs, extended downward past the fire-box C and ash-box D, between which a grate E of any suitable character is supported.

F is a horizontal water-bar connecting the lower parts of the water-legs; G, a water-chamber projected from the upper side of the same at the middle, and H a lug upon the top of the same through which bolt I is extended. A similar water-chamber G' is projected from the top of the section at the middle, and bolting-lugs H' are formed at opposite sides of the same upon the end sections to receive tie-bolts I'. The bolts I and I' serve to clamp all the sections together when in use without passing through or obstructing the waterway.

85 The water-chambers G and G' are provided upon opposite faces, respectively, with coupling-sockets *g g'*, which are shown formed with conical ground-seats to receive ground-joint nipples *f*, (shown in Fig. 6,) which form continuous passages common to all the sections at the top and bottom of the boiler. Pipes *h* and *h'* are connected, respectively, with the chambers G and G' to lead the fluid into and from the boiler.

95 Vertical slots are extended through the section and divided near the middle of their length by horizontal water-bars J, forming an upper and lower series of flue-passages K K'.

100 The body of the section containing such flue-passages is of less thickness than the top of the section and the edge portions of the same, and such edge portions are also made of less thickness than the water-bar F and the water-leg below the level of the grate.

To make the entire margin of the section



of the same thickness and the bottom of the water-leg, a rib L is formed above the grate upon both faces of the section at the margin, and such ribs are drawn in contact when the sections are mounted together, as shown in Fig. 1, which affords the heated gases access to the adjacent faces of the sections at all points above the grate. A deflecting-plate Q is shown in Fig. 5 within the section between the tops of the flue-passages and the coupling-sockets  $g'$ , which, when the boiler is used for generating steam, is employed to separate the steam from the water and to prevent the water from boiling over. The plate Q is preferably inclined upward from the middle toward each end.

The adjacent faces of the sections upon a level with the bars J are provided with horizontal cleats J' to support partition-plates  $a$ , which operate in connection with the bars J to intercept the rising gases and hold them longer in contact with the lateral faces of the sections. One of the partitions  $a$  is broken in Fig. 3 to clearly exhibit the cleats J'.

A front plate M is secured upon the front end of the sections and provided with fuel-door  $m$  opposite the fire-box and a box or cleaning-door M', which is adapted to cover the front ends of the flue-passages K and K' and to form a return-flue box for the same.

A back plate N is secured upon the rear end of the sections and provided with a smoke-box O, having a smoke-outlet P.

The smoke-box covers the rear ends of the flue-passages K K' and is provided with a damper O', adapted to close the lower passages K.

The partition-plates  $a$  are supported removably by the cleats J', and where the draft supplied to the boiler is good such plates may be applied, as shown in Fig. 6, to cut off the direct access of the gases from all the upper flue-passages K'.

With the damper closed, as indicated by dotted lines  $o'$  in Fig. 6, the gases which are intercepted by the partition-plates  $a$  are thrown forwardly through the passages K into the return-flue box N' and thence into the upper flue-passages K', from which they pass freely into the smoke-box. The partitions  $a$  may be removed from the ribs J' by turning them up edgewise, as shown at  $a'$  in Fig. 6, and then dropping them down into the fire-box, and where the draft is defective the partitions may be removed between the sections nearest to the return-flue box M', thus affording the gases a shorter circuit to the smoke-box.

It will be understood that the capacity of the boiler may be varied by employing a suitable number of the vertical sections, and the adaptation of the partitions  $a$  for removal adapts the furnace, whatever its size, to be suitably arranged for operating with the draft that may be available. The horizontal water-bar which connects the bottom of the water-legs receives the return fluid from the heat-

ing-radiators through the pipe  $h$  and distributes it effectively to every portion of the boiler, the heat around the ash-box being fully utilized in warming the water before it enters the body of the section. The horizontal form of the water-bars adapts them to form a flat bottom for the ash-box, and the water-chambers G and tie-bolt I, arranged along the middle line of the bottom, are so disposed as not to interfere with the removal of the ashes. The sections are of such nature that special castings are not required for the front or rear section of the boiler, as in some constructions, and the patterns required to make the castings for a boiler are thereby considerably cheapened.

The labor required to fit up and connect the several sections is exceedingly small, while the introduction of the heated gases to the entire adjacent faces of the sections and the circulation of such gases forward and backward through the flue-passages K K' secure a high degree of efficiency with a minimum of cost.

Where the boiler is used for making steam, the deflecting-plate Q serves a very useful purpose to prevent water from boiling up into the pipes  $h'$ , but where the boiler is used for heating water only the deflecting-plate is omitted from the section, as it would seriously obstruct the free passage of the water to the pipes  $h'$ .

I am aware that it is common to connect fittings by means of slip-nipples, and that it is also common to make that portion of the section through which the smoke-flues are formed of less thickness than the edges of the section. My sections differ from previous constructions in having two sets of flue-passages above the fire-arch, (which extends transversely between the water-legs above the fire-box,) with means, as the horizontal partition-plates  $a$ , to confine the gases to the lower passages in their forward movement. By this construction all the sections in the boiler may be made from the same pattern and the partition-plates may be made to produce a direct and return movement of the gases, as indicated by the arrows in Fig. 6.

I am aware that horizontal water-bars have been used over the fire-box to form the crown of the fire-box and absorb the radiant heat, but I am not aware that the bottom of the ash-box has ever been formed of horizontal water-bars connecting the lower ends of the water-legs, such water-legs being extended below the level of the grate for that purpose. By this construction, and especially where the return water-pipe  $h$  is connected with the middle of the horizontal bars F, the fluid is distributed most effectively to every portion of the boiler and the heat radiated toward the sides and bottom of the ash-box fully utilized in warming the water before it enters the body of the section.

Having thus set forth the nature of the invention, what I claim herein is—



1. A steam or hot-water boiler comprising a series of flat vertical sections of uniform pattern, each having water-legs connected at the bottom by a horizontal water-bar and provided upon opposite sides with coupling-sockets to form a water connection, each section having a fire-arch extended transversely between the sides, with two sets of flue-passages through the section above the fire-arch, and a grate arranged intermediate to the fire-arch and bottom water-bar to form a fire-box and ash-box above such water-bar, substantially as herein set forth.

2. A steam or hot-water boiler comprising a series of flat vertical sections each having two sets of flue-passages through the upper part for the direct and return movement of the gases, and having water-legs with fire-box and ash-box between the same, with grate supported on the water-legs between the fire-box and ash-box, and the water-legs in each section being connected at the bottom by a horizontal water-bar with a water-chamber upon the upper side at the middle, and coupling-sockets upon the opposite sides of such chamber, as and for the purpose set forth.

3. In a steam or hot-water boiler, a series of flat vertical sections each having two sets of flue-passages through the upper part for the purpose set forth, and water-legs with fire-box and ash-box between the same, the lower ends of the water-legs being connected by a horizontal water-bar forming the bottom of the ash-box, the top of each section and the said water-bar being provided at the middle with upwardly-projecting water-chambers having coupling-sockets upon opposite sides, as and for the purpose set forth.

4. A steam or hot-water boiler comprising a series of flat vertical sections each having two sets of flue-passages through the upper part for the purpose set forth, and having water-legs with fire-box and ash-box between the same, with grate supported upon the water-legs between such boxes, the lower ends of the water-legs being connected by a horizontal water-bar, and the water-leg below the level of the grate having the full thickness of the section, and above such level being made of less thickness and provided with a marginal rib at the edge, as and for the purpose set forth.

5. A steam or hot-water boiler comprising a series of flat vertical sections, each having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar forming a flat bottom for the ash-box, the body of each section above the fire-box being of less thickness than the edges of the section, and having two series of flue-passages extended through the same, one above the other, with intermediate horizontal partition-plates inserted between the sections, as and for the purpose set forth.

6. A steam or hot-water boiler comprising a series of flat vertical sections, each having

water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar forming a flat bottom for the ash-box, the body of each section above the fire-box being of less thickness than the edges of the section, and having two series of flue-passages extended through the same, one above the other, supporting-ribs upon the adjacent faces of the sections between the two series of passages, partition-plates supported removably upon such ribs, a return-flue box covering both series of passages at the front of the boiler, and a smoke-box connected with the upper series at the rear of the boiler, as and for the purpose set forth.

7. A steam or hot-water boiler comprising a series of flat vertical sections, each having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar forming a flat bottom for the ash-box, the body of each section above the fire-box being of less thickness than the edges of the section, and having two series of flue-passages extended through the same, one above the other, with intermediate partition-plates inserted between the sections, a return-flue box covering both series of passages at the front of the boiler, and a smoke-box covering both series of passages at the rear of the boiler, with a damper adapted to close the outlet from the lower series, substantially as herein set forth.

8. A steam or hot-water boiler comprising a series of flat vertical sections having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar, the body of each section above the fire-box being of less thickness than the edges of the section, with two series of flue-passages extended through the same, one above the other, a return-flue box covering both series of passages at the front of the boiler, means for deflecting the smoke through the lower series of passages into such flue-box and thence into the upper series of passages, and a smoke-box connected with the upper series at the rear of the boiler, as and for the purpose set forth.

9. A steam or hot-water boiler comprising a series of flat vertical sections having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar, the body of each section above the fire-box being of less thickness than the edges of the section, with two series of flue-passages extended through the same, one above the other, and means for conducting the smoke or gases forward through the lower series of passages and backwardly through the upper series of passages, with a smoke-box to receive the gases from the same, the gases passing not only through the flue-passages but circulating between the bodies of the several sections, substantially as herein set forth.

10. A steam or hot-water boiler comprising



a series of flat vertical sections, each having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar forming a flat bottom for the ash-box, the body of each section above the fire-box being of less thickness than the edges of the section, and having two series of flue-passages extending through the same, one above the other, a return-flue box covering both series of passages at the front of the boiler, means for deflecting the smoke through the lower series of passages into such flue-box and thence into the upper series of passages, a smoke-box covering both series of passages at the rear of the boiler with a damper adapted to close the outlet from the lower series, the top of each section and the water-bar at the bottom of each section being provided at the middle with an upwardly-projecting water-chamber, couplings connecting such water-chambers in a continuous line to form central steam and water passages common to all the sections, and steam and water pipes  $h$   $h'$ , connected respectively with such central passages, as and for the purpose set forth.

11. A steam or hot-water boiler comprising a series of flat vertical sections, each having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar forming a flat bottom for the ash-box, the body of each section above the fire-box being of less thickness than the edges of the section, and having two series of flue-passages extended through the same, one above the other, with intermediate partition-plates inserted between the sections, the top of each section and the said water-bar being provided at the middle upon opposite sides with couplings adapted to form a water connection, a grate supported upon the water-legs over the fire-box, a front plate having ash-door, fuel-door, and a return-flue box covering both series of passages with door for cleaning out said passages, and a back plate closing the fire-box and ash-box and provided with a smoke-box covering both series of passages, and having a damper adapted to close the outlet from the lower series, the whole arranged and operated substantially as herein set forth.

12. In a steam or hot-water boiler, a flat vertical section having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar, the body of the section above the fire-box being of less thickness than the edges of the section, and having two series of flue-passages extended through the same, one above the other, and coupling-sockets upon opposite faces of the section at the middle of the top and bottom, substantially as herein set forth.

13. In a steam or hot-water boiler, a flat vertical section having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal

water-bar, the body of the section above the fire-box being of less thickness than the edges of the section, and having two series of flue-passages extended through the same, one above the other, and the margin of the section being provided with a rib to separate the sections when united, to expose their adjacent faces to the heated gases, substantially as herein set forth.

14. In a steam or hot-water boiler, a flat vertical section having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar, the body of the section above the fire-box being of less thickness than the edges of the section, and having two series of flue-passages extended through the same, one above the other, and the water-leg below the level of the grate having the full thickness of the section and above such level being made of less thickness and provided with a marginal rib at the edge, and the section having coupling-sockets upon opposite faces of the section at the middle of the top and bottom, substantially as herein set forth.

15. In a steam or hot-water boiler, a flat vertical section having water-legs with fire-box and ash-box between the same, the body of each section above the fire-box having flue-passages extended through the same, coupling-sockets upon opposite faces of the section at the middle of the top, and the interior of the section between the top of the passages and such coupling-sockets being provided with a deflecting-plate, as and for the purpose set forth.

16. In a steam or hot-water boiler, a flat vertical section having water-legs with fire-box and ash-box between the same, the body of each section above the fire-box having flue-passages extended through the same, coupling-sockets upon opposite faces of the section at the middle of the top, and the interior of the section between the top of the passages and such coupling-sockets being provided with a deflecting-plate inclined upwardly toward each end from the middle of the section, as and for the purpose set forth.

17. In a steam or hot-water boiler, a flat vertical section having water-legs with fire-box and ash-box between the same, the body of each section above the fire-box being of less thickness than the top and sides of the section, and having flue-passages extended through such body, coupling-sockets upon opposite faces of the section at the middle of the top, and the interior of the section between the top of the passages and such coupling-sockets being provided with a deflecting-plate, substantially as set forth.

18. A steam or hot-water boiler comprising a series of flat vertical sections, each having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar, the body of each section above the fire-box being of less thickness than the edges of the section



and having a series of vertical slots forming flue-passages through the sections, with means for dividing such slots transversely, and for closing the adjacent space between the bodies of the sections to form direct and return flues, substantially as herein set forth.

19. A steam or hot-water boiler comprising a series of flat vertical sections, each having water-legs with fire-box and ash-box between the same, and the lower ends of the water-legs connected by a horizontal water-bar, the body of each section above the fire-box being of less thickness than the edges of the section and having a series of vertical slots forming flue-passages through the sections, with means for dividing such slots transversely,

and closing the adjacent space between the bodies of the sections to form direct and return flues, and each section being provided at the middle above the tops of such flues with coupling-sockets upon opposite faces, and with a deflecting-plate arranged within the section below such sockets and inclined upwardly toward each end from the middle of the section, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH J. BLACKMORE.

Witnesses:

ELBERT O. HASKINS,  
THOMAS S. CRANE.