

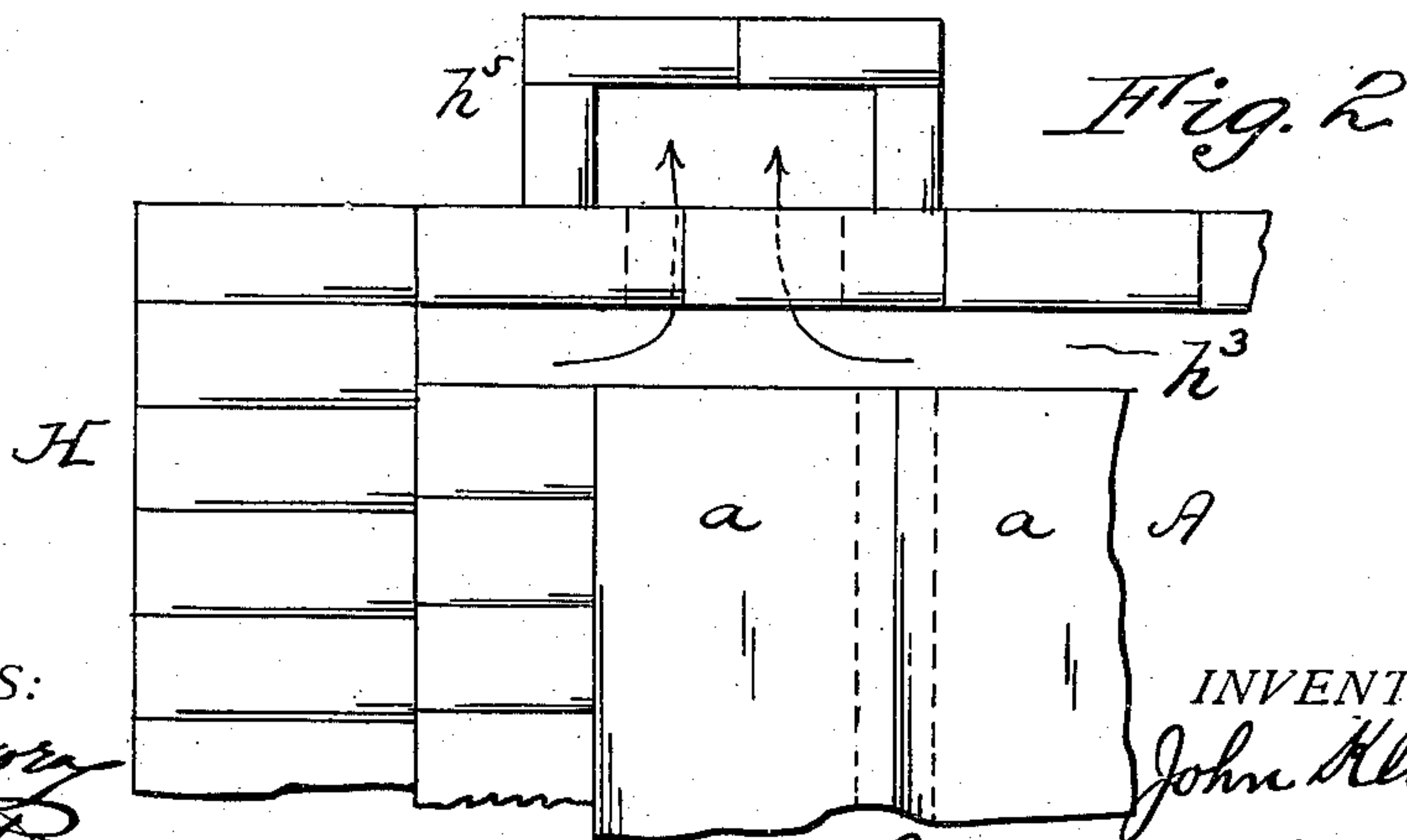
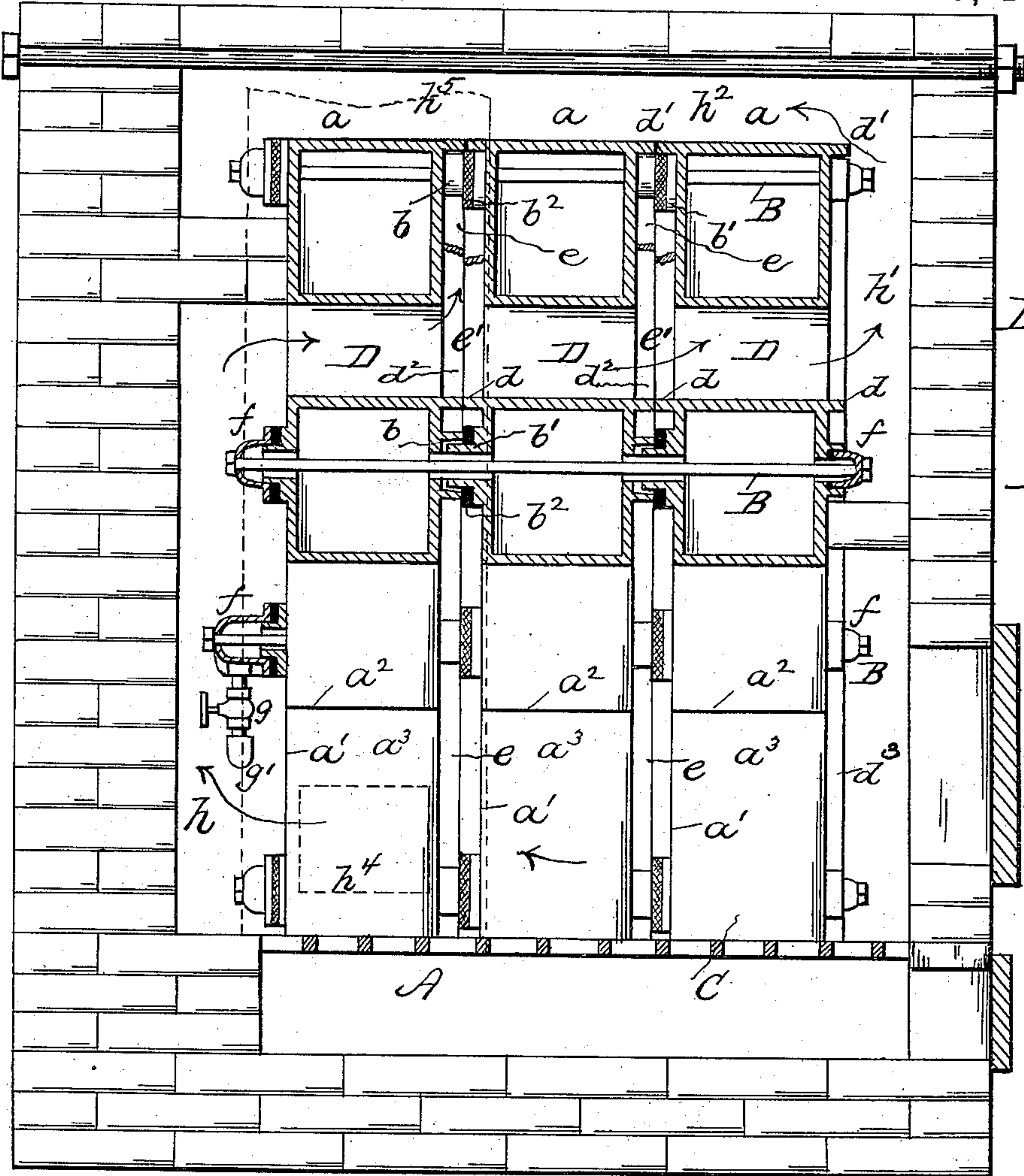
(No Model.)

2 Sheets—Sheet 1.

J. KLING, Jr.  
SECTIONAL STEAM GENERATOR.

No. 376,098.

Patented Jan. 10, 1888.



WITNESSES:

*Chas. F. Van Stavern*  
*Geo. R. Byington*

INVENTOR

*John Kling Jr.*

*By. J. Van Stavern*

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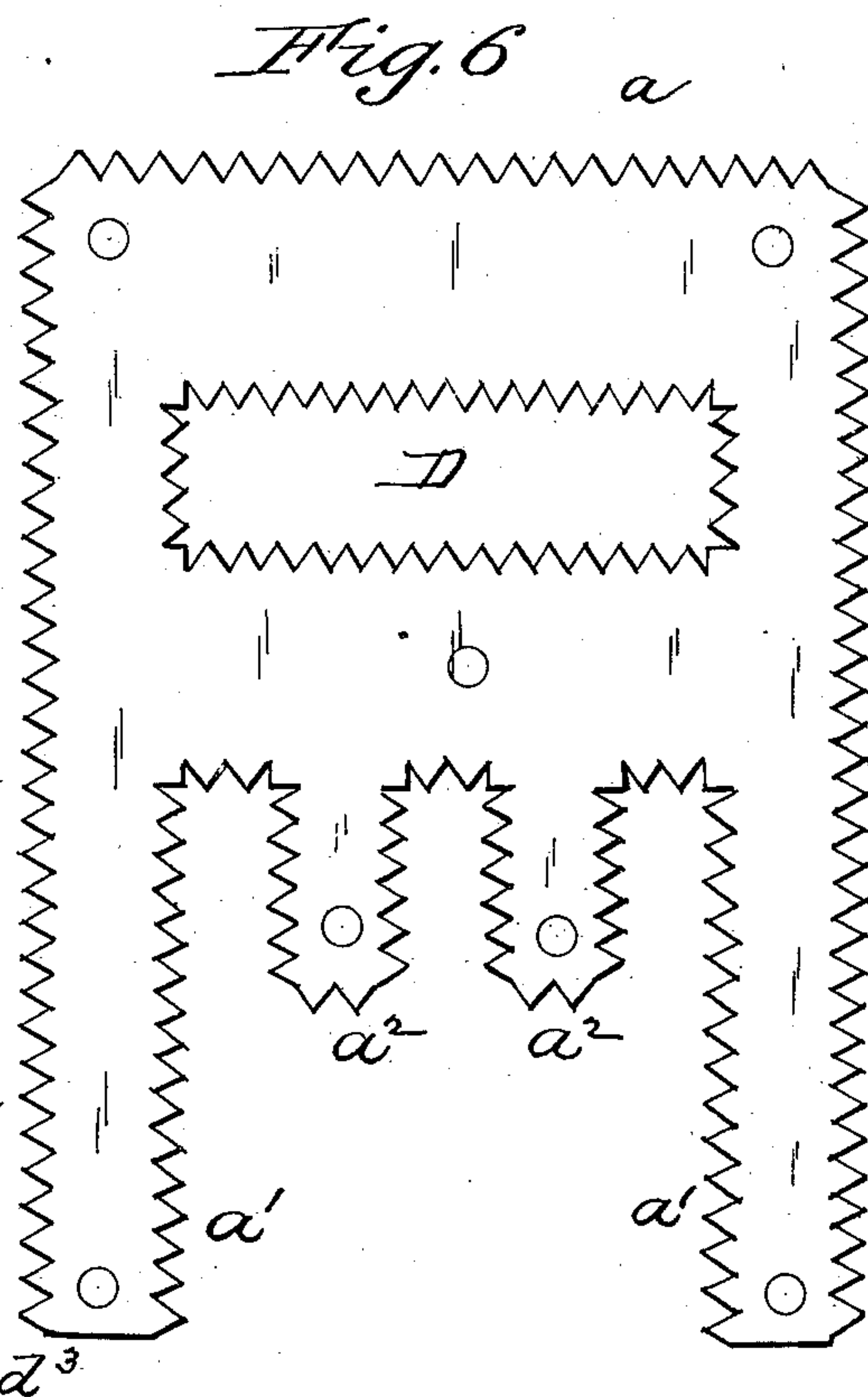
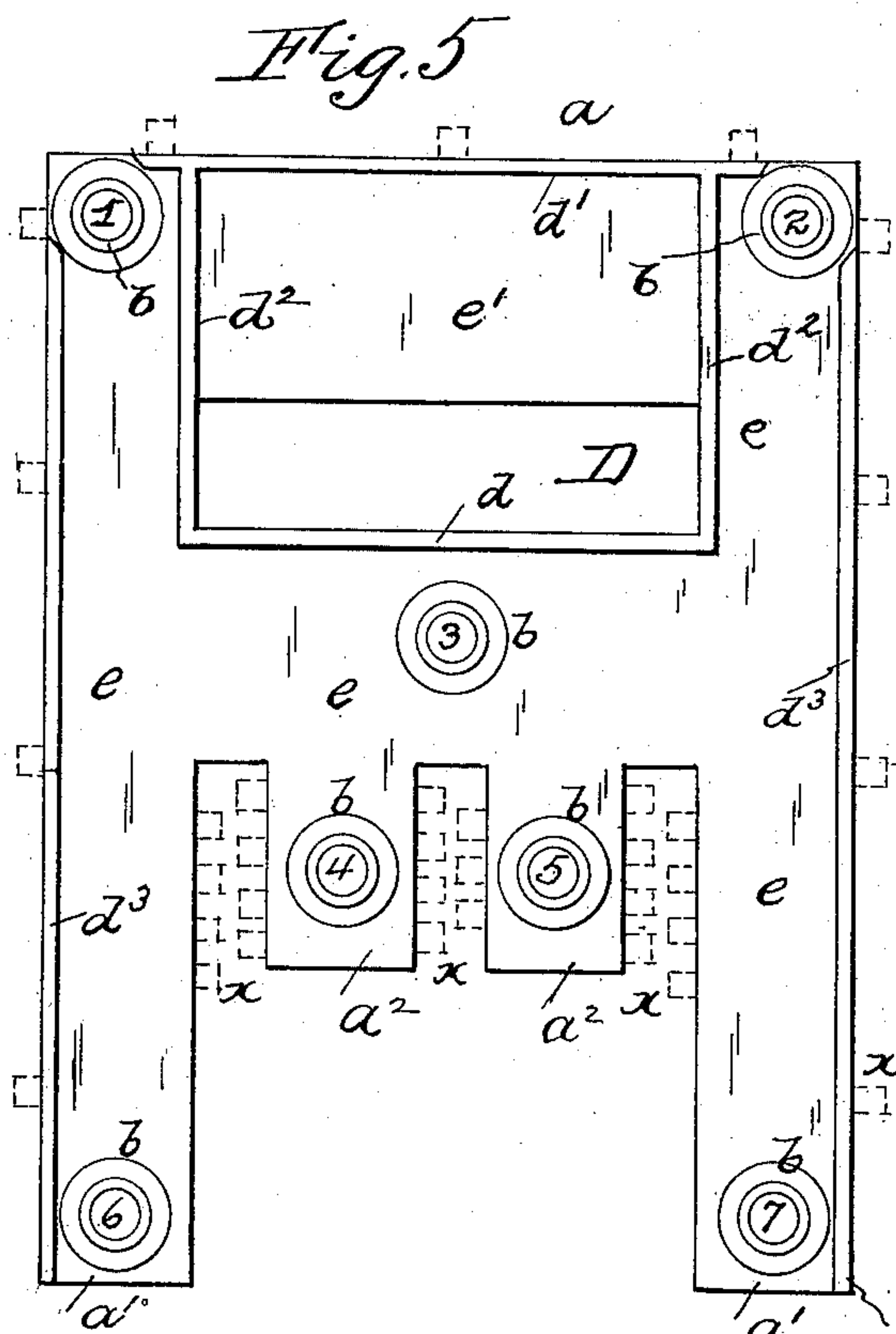
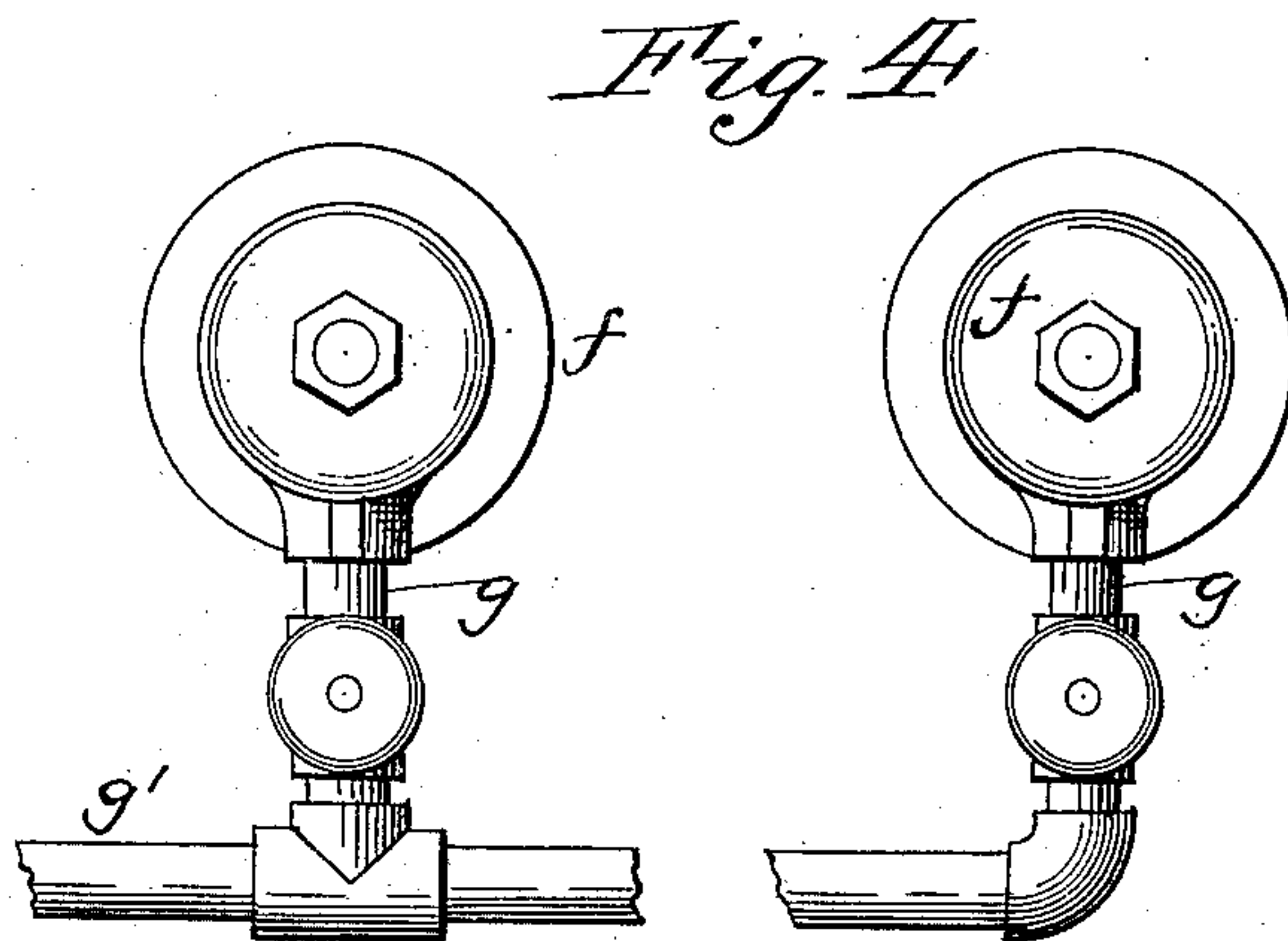
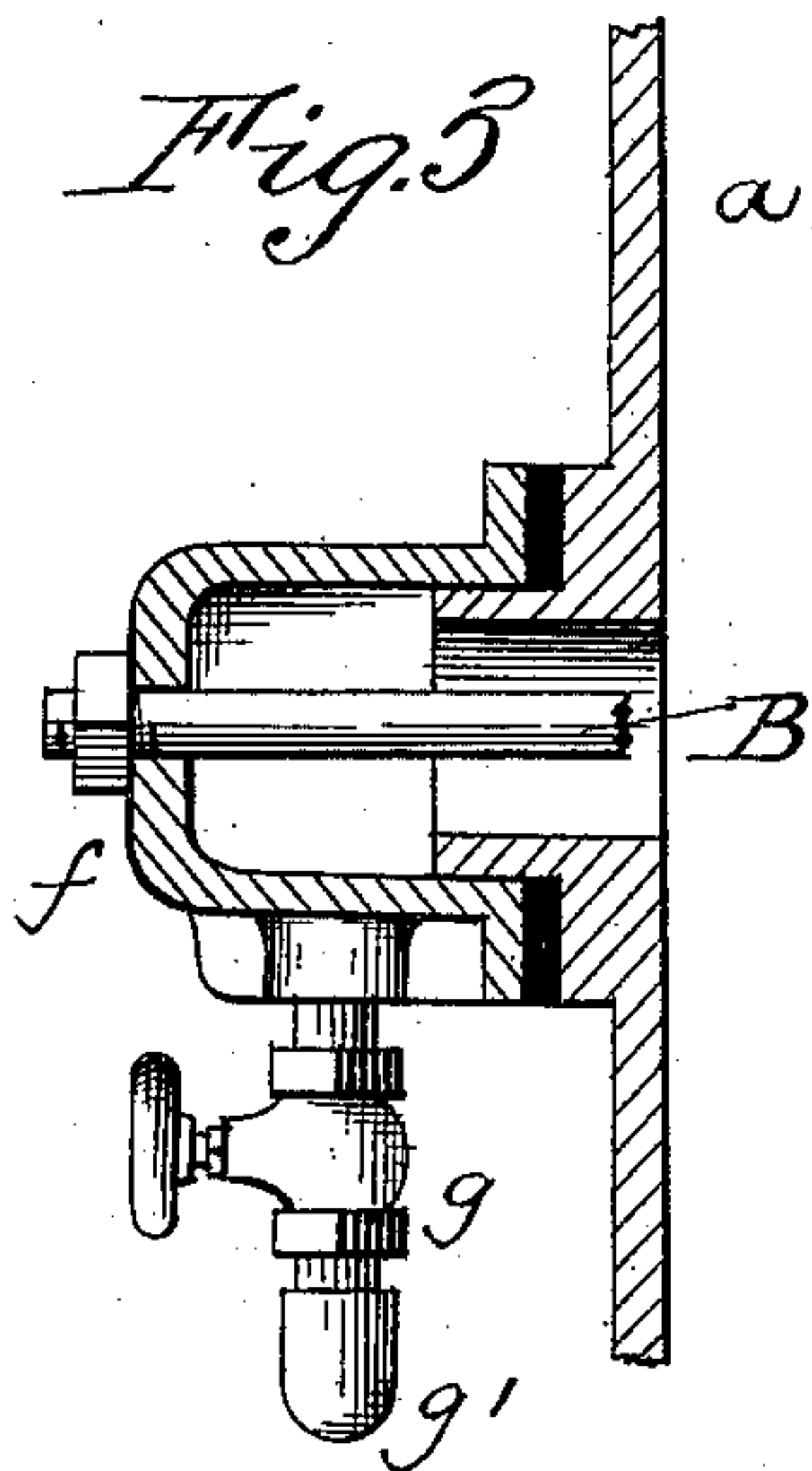
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INVENTOR,

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# UNITED STATES PATENT OFFICE.

JOHN KLING, JR., OF PHILADELPHIA, PENNSYLVANIA.

## SECTIONAL STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 376,098, dated January 10, 1888.

Application filed April 11, 1887. Serial No. 234,416. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN KLING, Jr., a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Sectional Steam-Boilers, of which the following is a specification.

My invention has relation to sectional steam-boilers; and it has for its object a construction of the sections which admits of easily and economically connecting any number of sections together, of correspondingly removing any imperfect or worn-out section from a group of sections for replacement, of presenting a large extent of heating-surface for each section, and of providing a tortuous path through a group of sections for the products of combustion and heat-currents, whereby part of each section is directly and the remaining part indirectly exposed to the heat of the fire-box to fully utilize the caloric of the same to the greatest possible advantage before escaping into the stack or chimney.

My invention accordingly consists of the combination, construction, and arrangement of parts, as hereinafter more fully described and claimed, having reference particularly to a steam-generator section of preferably a rectangular configuration, having outer long and inner short legs, with open space between the long legs and below the short legs for fire-box or furnace, and above the short legs and between them and the top of the section another open space or flue, which acts in conjunction with suitable vertical and horizontal flanges projecting from the front and rear sides of the section (when a number of sections are grouped together to form a generator) to direct the heat-currents and products of combustion first against the sides of the sections forming the fire-box, and then from the fire-box to said flue or opening in the sections above the fire-box to the top of the sections, and thence over the top and down the outside of the sections to the stack or chimney, suitable bolt-connections being used to secure or group the sections together, and a suitable casing and cleaning or blow-out pipes being provided for the sections.

Reference being had to the accompanying

drawings, which illustrate a sectional steam-generator constructed in accordance with my improvements, Figure 1 is a longitudinal section of same; Fig. 2, a broken horizontal section showing location of stack or chimney with reference to the generator; Fig. 3, a sectional detail, drawn to an enlarged scale, of end caps for the bolts connecting the generator-sections; Fig. 4, an end view, partly broken away, of cleansing or blow-off pipe for the generator-sections; Fig. 5, an elevation of a generator-section detached; and Fig. 6, a like view showing its surfaces fluted, corrugated, or otherwise formed to afford increased heating-surface therefor.

A represents a generator composed of sections  $a$ , which are preferably of a rectangular form, as shown, arranged vertically side by side, with intervening spaces and connected by bolts B. Each section has two outer lower legs,  $a'$ , which form part of the section, and between these are one or more separate shorter legs,  $a''$ . Both of these legs bound a space,  $a^3$ , in each section for making a longitudinal fire-box or furnace, C, when a number of sections are grouped together, as shown in Fig. 1, into which the short legs  $a''$  depend. Above the latter and between them and the top of each generator-section is preferably an oblong opening, D, having at its bottom and on each side of the section edge flanges or projecting ledges  $d$ . A like flange,  $d'$ , is provided at the top edges of each section on each side thereof, and like flanges,  $d^2$  and  $d^3$ , are respectively located or formed at the vertical edges of the openings D and at the outer edges of the legs  $a'$ , on both sides thereof, which vertical flanges extend or pass up to the top flanges,  $d'$ . The edges of these flanges come together or meet when the sections are grouped together to provide intervening spaces  $e$  and  $e'$  between adjoining sections, the spaces  $e$  communicating directly with the fire-box C and extending up the legs  $a'$  to the top of the sections, and the spaces  $e'$  being cut off from such direct communication by reason of the flanges  $d$  and  $d^2$  of each section joining each other, as indicated more plainly in Fig. 5.

The various bolt-openings 1, 2, 3, 4, 5, 6, and 7 in the sections are made considerably larger than the diameter of the bolt B, pass-



ing therethrough, and these openings on one side of the section having a female joint or socket,  $b$ , and on the other side a male joint or coupling part,  $b'$ , so that when two sections are properly placed side by side the male parts of one fit into the female parts of the other, to make joints between the sections, which joints are made water-tight by suitably inserting asbestos or other desired gaskets,  $b^2$ , between said parts, as desired or as shown in Fig. 1.

The end sections are provided with suitable caps,  $f$ , for closing said openings, and in these caps the bolts have their bearings, as indicated, so that the sections of a group communicate with one another by way of openings 1, 2, 3, 4, 5, 6, and 7 at the top, bottom, and intervening parts, and also at their short legs,  $a^2$ . The end caps for the latter may be furnished with suitable blow-out or cleansing pipe-connections,  $g$   $g'$ , suitably valved, as deemed necessary, and, if desired, the remaining caps, or such as are essential, may also be furnished with blow-out pipes.

The sections  $a$  may be plain, as shown in full lines, Fig. 5, or their surfaces adjacent to the fire-box and heat-flues may be provided with projecting lugs, pins, or ribs for increasing the extent of their heating-surfaces, as indicated by dotted lines  $x$ ; or the section sides or surfaces may be fluted, corrugated, or similarly configured for a like purpose. The sections are preferably arranged or located within a casing or brick-work,  $H$ , having lower back flue,  $h$ , which leads to section-openings  $D$ , and front upper flue,  $h'$ , communicating with openings  $D$  and the top and side flues,  $h^2$   $h^3$ , respectively, of casing  $H$ . From the bottom, preferably, of the flues  $h^3$  a short flue,  $h^4$ , leads to a stack or chimney,  $h^5$ . This described construction of sections and casing provides a tortuous passage-way or circulation for the products of combustion and heat-currents through said parts. Thus the flames in the fire-box come into direct contact with the long and short legs of the sections and pass directly into the spaces  $e$  between the sections to the top of the same, being confined thereto by the flanges  $d'$  and  $d^3$ . The products of combustion and heat-currents circulate, as indicated by the arrows in Fig. 1, from fire-box  $C$  to flue  $h$ , into and through section-openings  $D$  and into the spaces  $e'$  between the sections, being confined thereto by the flanges  $d$   $d^2$  on the sections. From openings  $D$  the circulation is

thence into flue  $h'$ , to the top flue,  $h^2$ , and side flues,  $h^3$ , of the casing, to the chimney or stack flue  $h^5$ , so that all the surfaces of the sections are successively exposed to the heat-currents, and part of said surfaces are directly exposed to the flames in the fire-box, to accomplish the best possible results in an economical manner as regards the amount of consumption of fuel.

In grouping the sections  $a$  the edges of their flanges  $d$   $d'$   $d^2$   $d^3$  are preferably covered or smeared with red lead, fire-clay, or other material to make tight joints between them.

It is obvious that the details of my improvements may be varied without departing from the spirit of the same.

What I claim is—

1. A steam-generator section having outer lower legs,  $a'$ , shorter intermediate legs,  $a^2$ , bounding part of a direct flue or fire-box space,  $a^3$ , and a return-flue,  $D$ , separate from and cut off from flue  $a^3$  by edge flanges,  $d$   $d^2$ , substantially as set forth.

2. The combination of a series of steam-generator sections having lower direct flue,  $a^3$ , and upper return-flue,  $D$ , cut off from flue  $a^3$ , bolt-openings, end caps,  $f$ , and bolts  $B$ , passing through the sections and said caps, substantially as set forth.

3. The section  $a$ , having opening  $D$ , flanges  $d$   $d'$   $d^2$   $d^3$ , and depending short legs or limbs  $a^2$ , provided with bolt-openings which have male and female couplings, respectively, on opposite sides of the sections, substantially as set forth.

4. In combination with a casing or brick-work having top, side, front, and rear interior flues, a sectional generator having through it a flue near its top part communicating with the front and rear casing-flues, and a fire box in the generator-sections communicating with the rear casing-flue, substantially as set forth.

5. The sectional generator  $A$ , in which the sections  $a$  have flue-openings  $D$  and fire box spaces  $a^3$ , in combination with casing  $H$ , having front, rear, and top flues communicating with a stack or chimney, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN KLING, JR.

Witnesses:

FREDK. A. SOBERNHEIMER,  
S. J. VAN STAVOREN.