

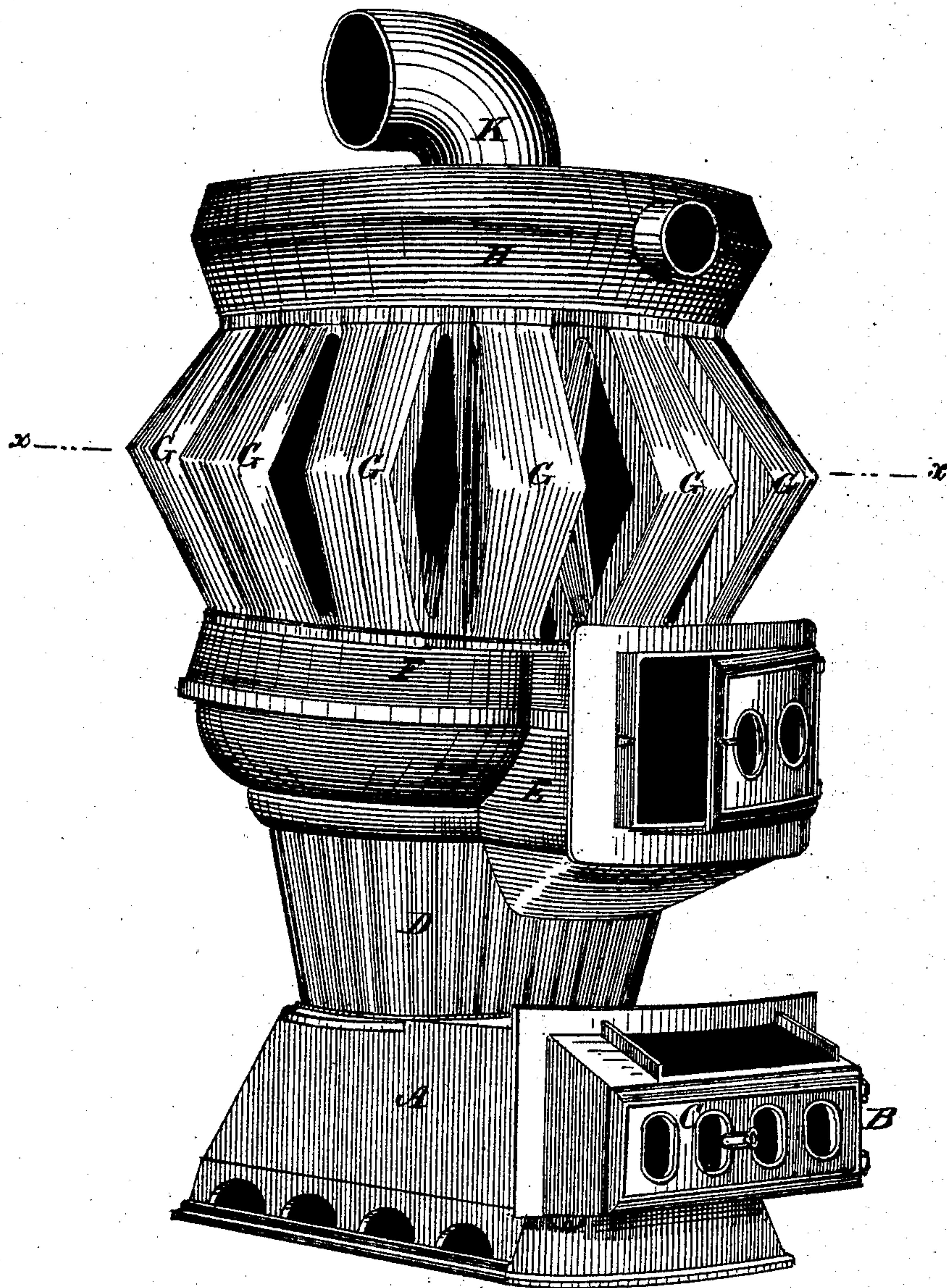
J. A. Lawson.

Impt in Hot Air Furnaces.

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PATENTED JUL 4 1871

Fig. 1.



Witnesses,

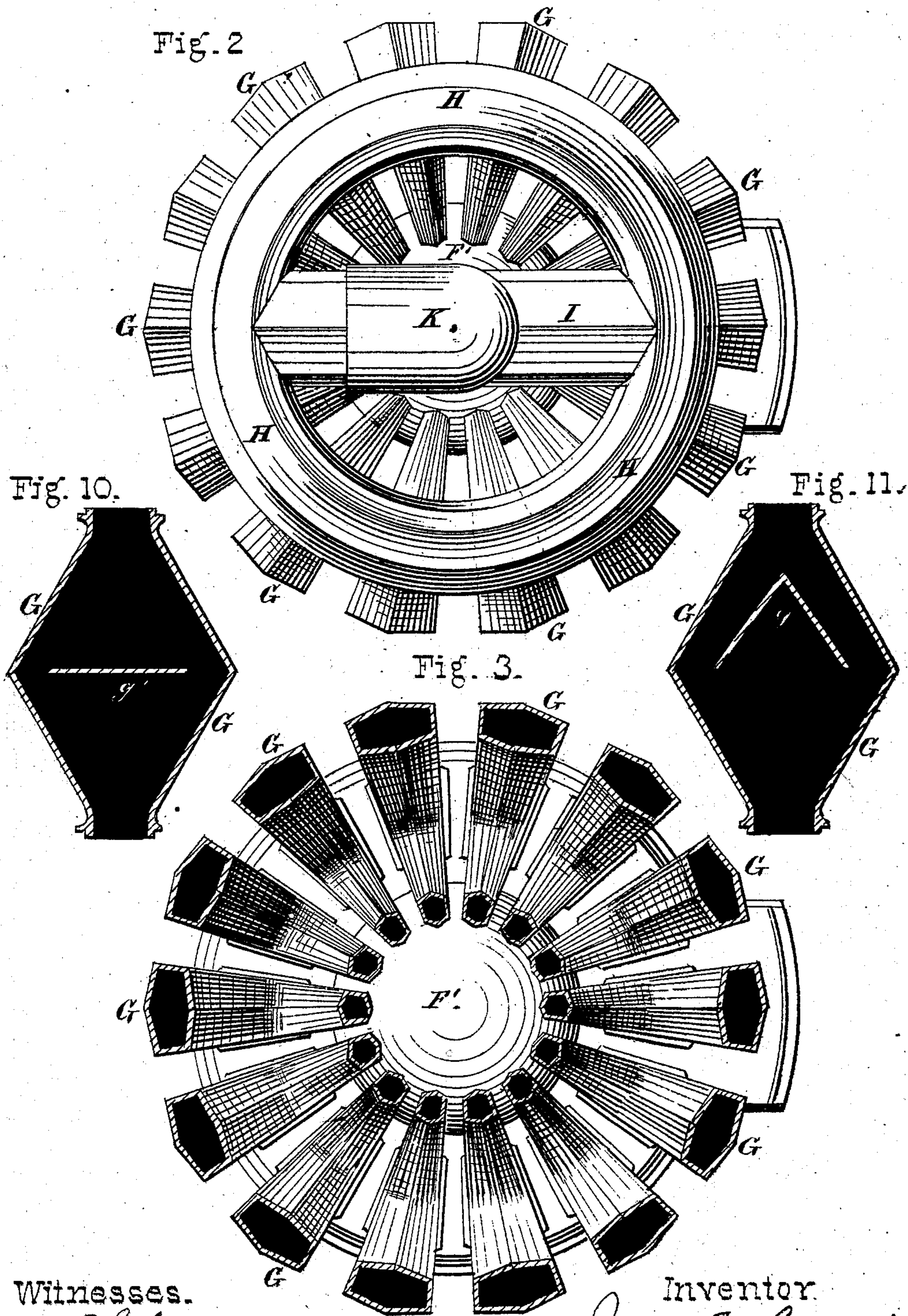
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Witnesses.

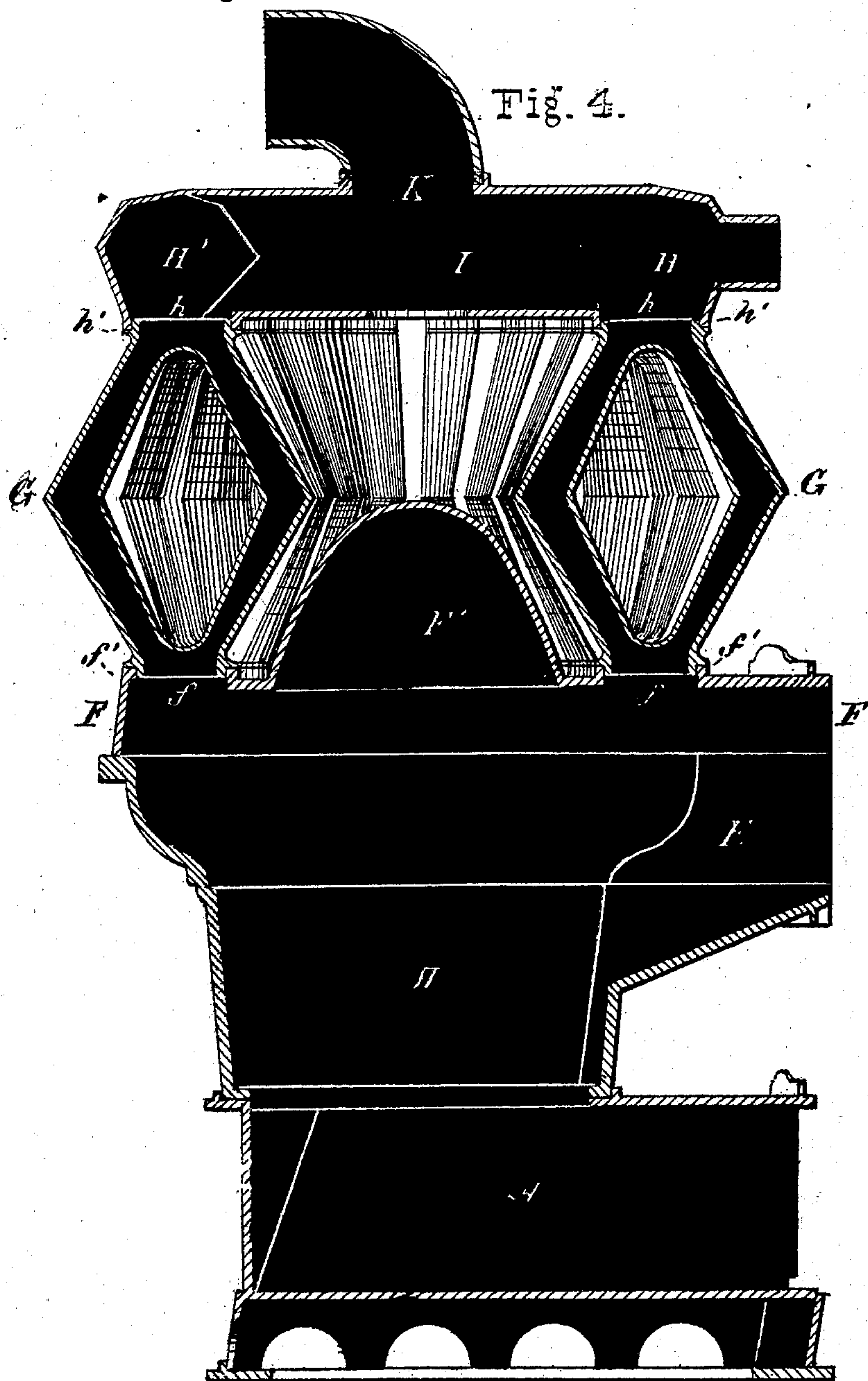
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Fig. 5.

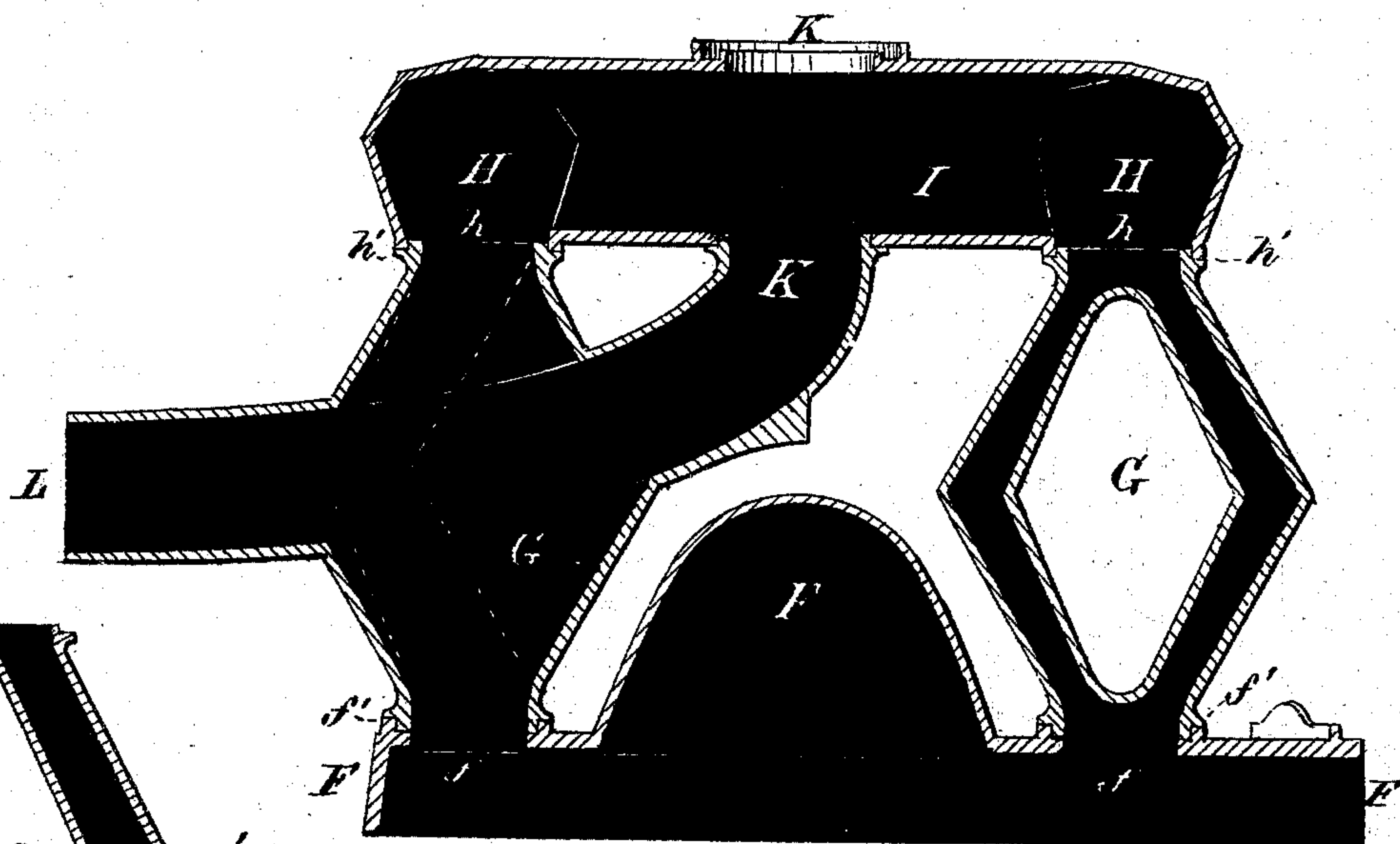


Fig. 9.

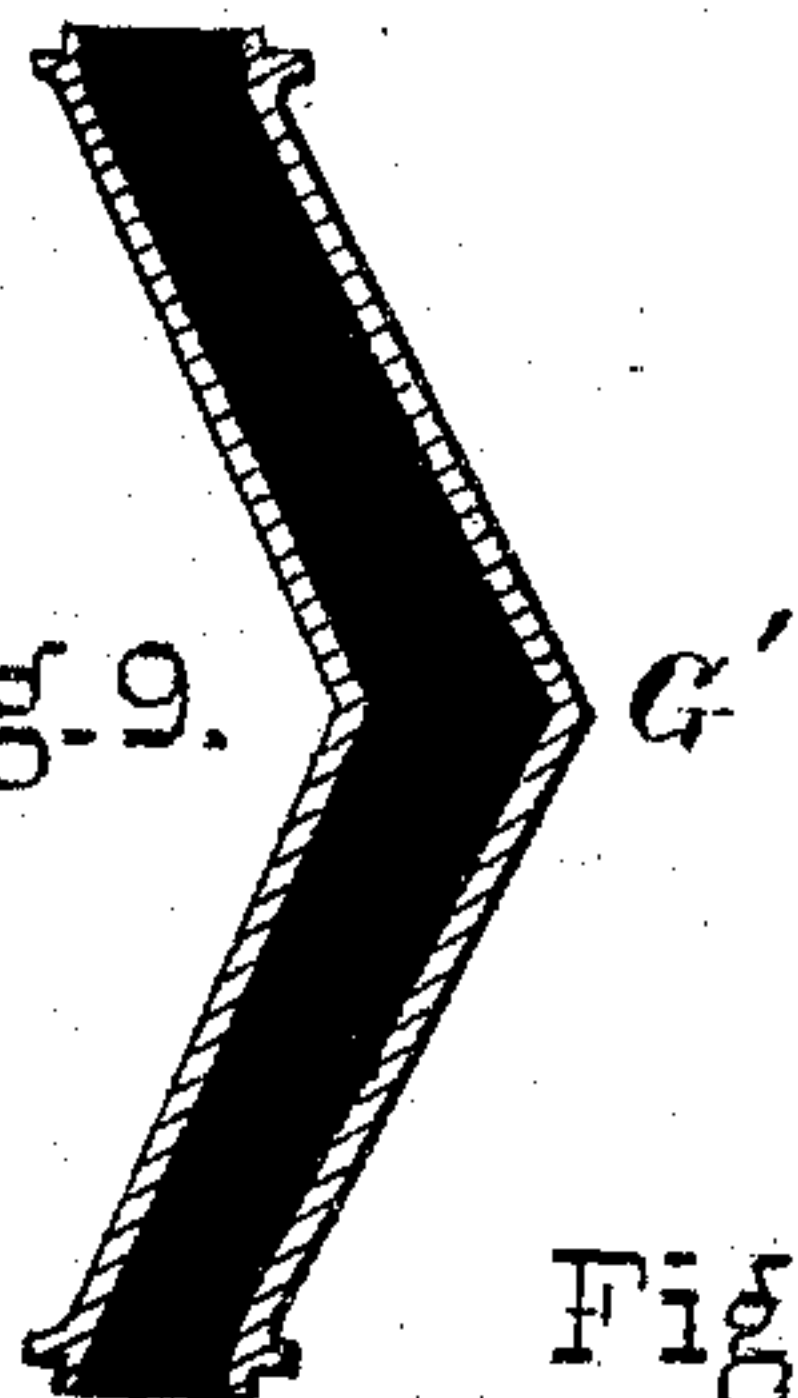


Fig. 6.

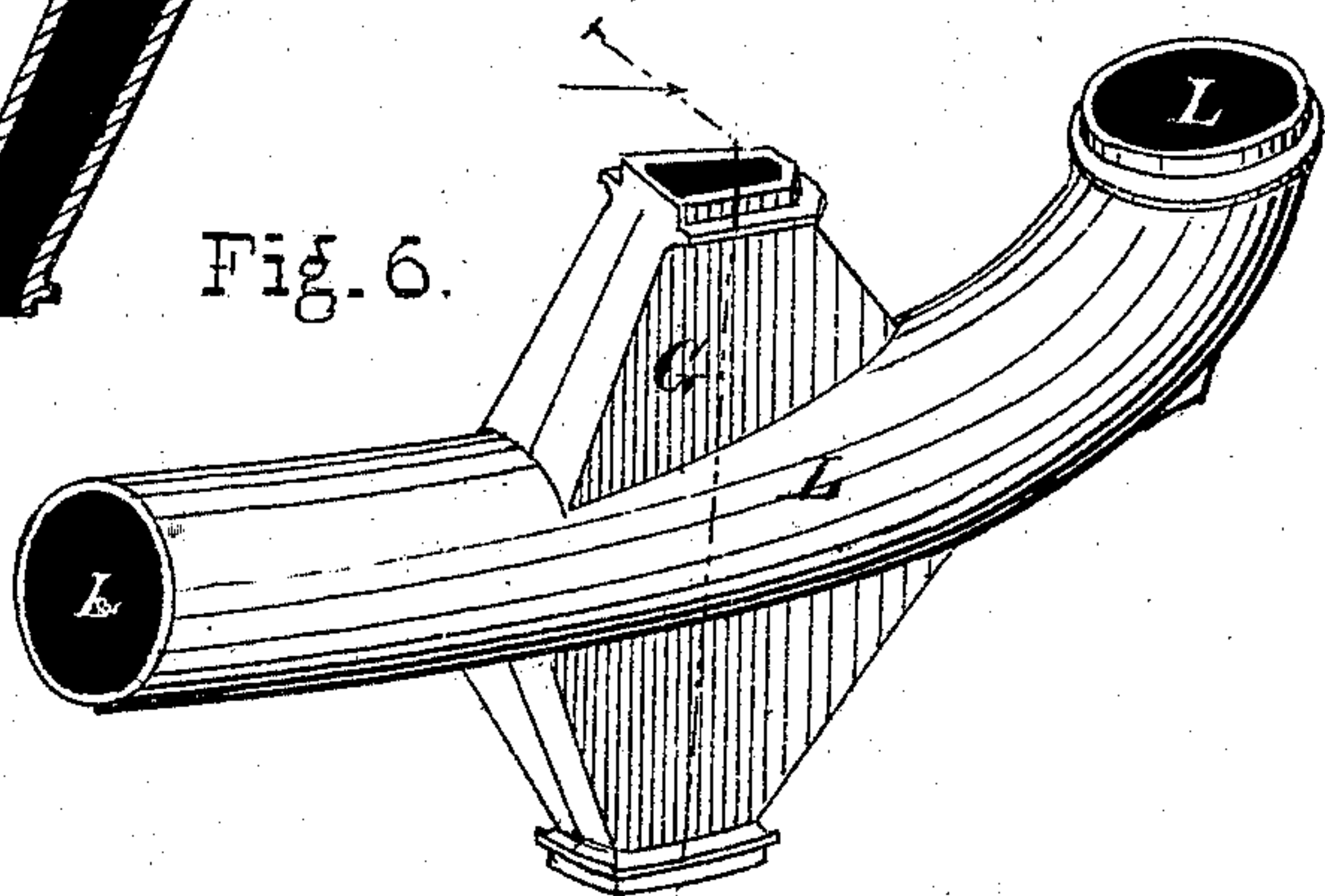


Fig. 7.

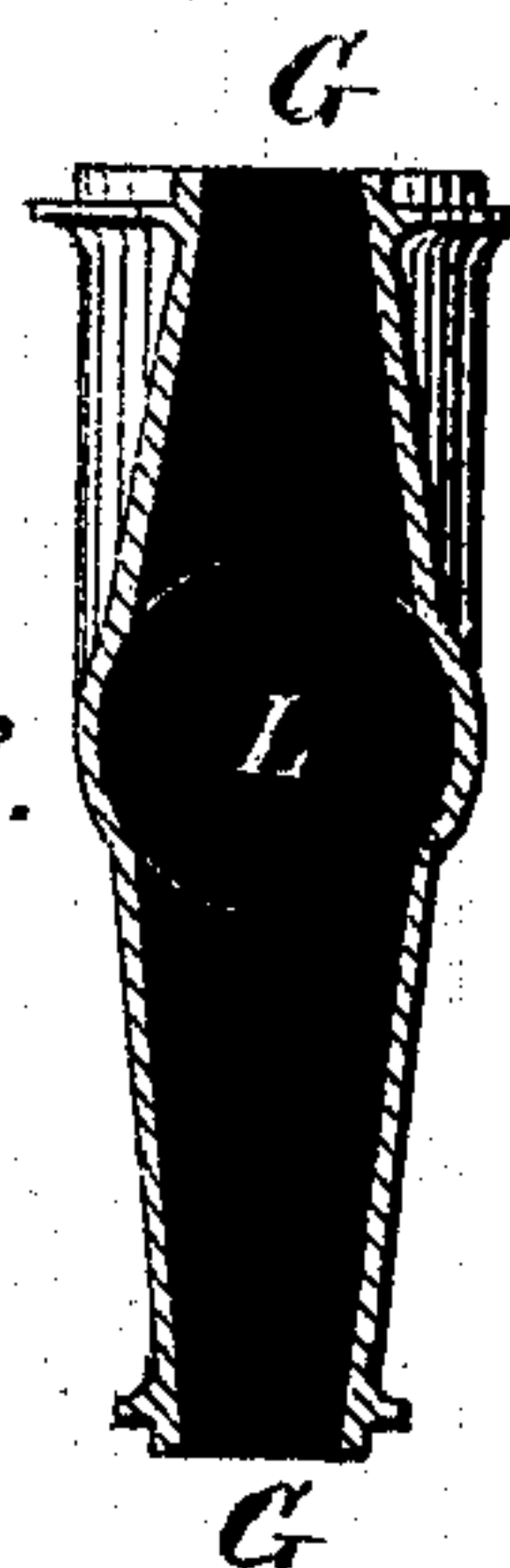
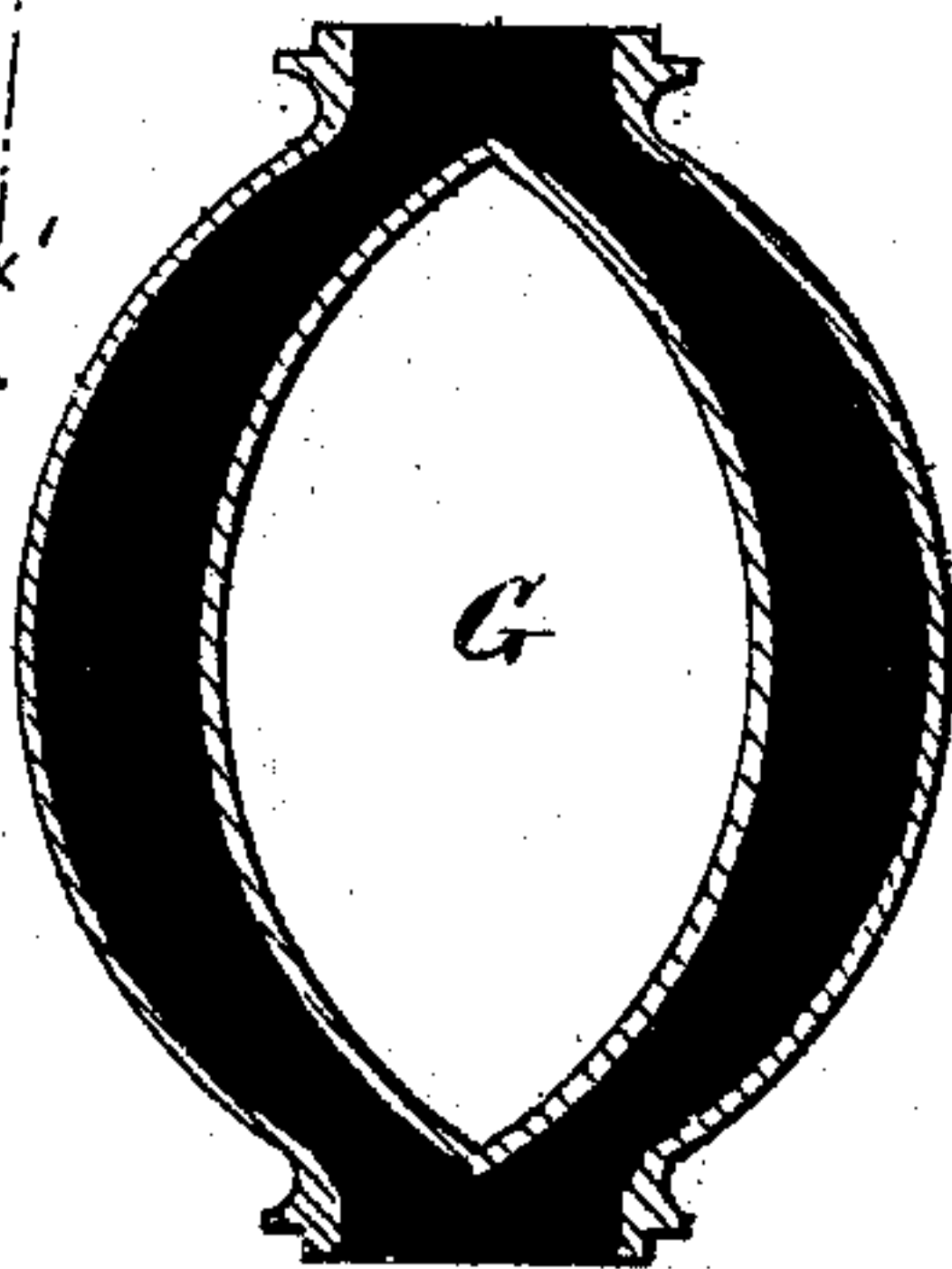


Fig. 8.



Witnesses.

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Fig. 12

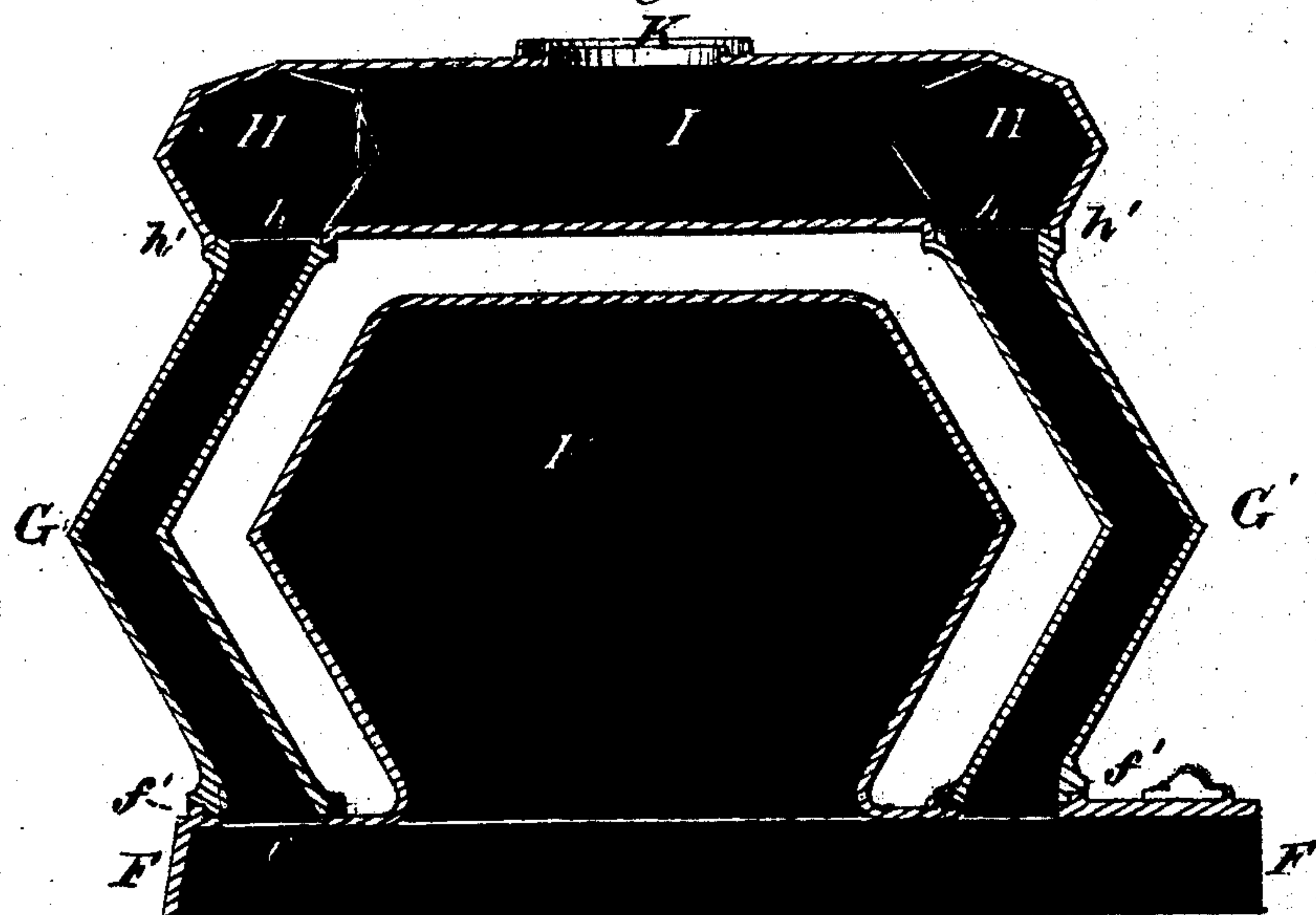
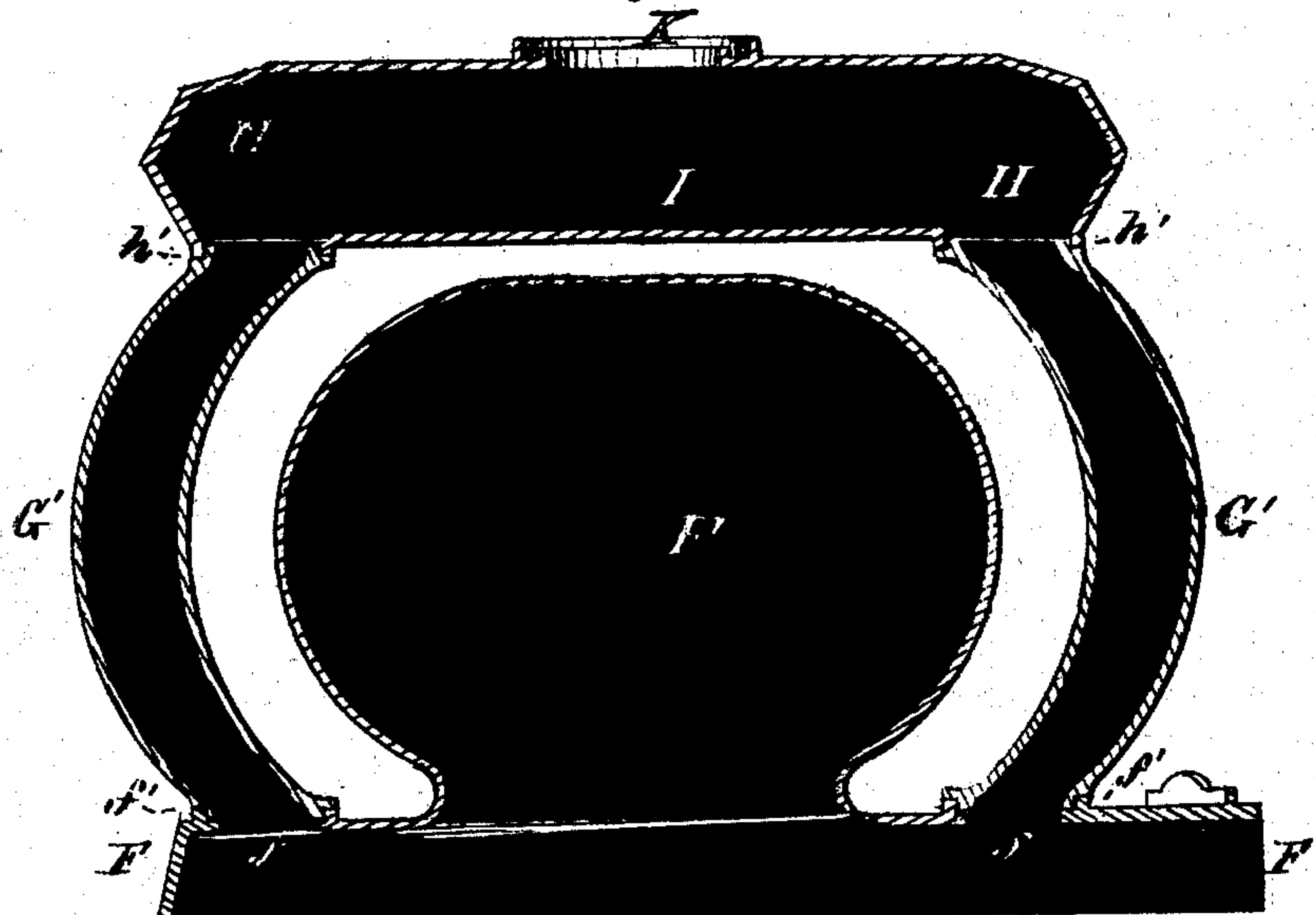


Fig. 13.



Witnesses.

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UNITED STATES PATENT OFFICE.

JAMES A. LAWSON, OF TROY, NEW YORK.

IMPROVEMENT IN HOT-AIR FURNACES.

Specification forming part of Letters Patent No. 116,724, dated July 4, 1871.

To all whom it may concern:

Be it known that I, JAMES A. LAWSON, of Troy, in the county of Rensselaer and in the State of New York, have invented certain new and useful Improvements in Hot-Air Furnaces; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing making a part of this specification, in which—

Figure 1 is a perspective view of my improved furnace. Fig. 2 is a plan view of the upper side of the same. Fig. 3 is a horizontal section on the line *x x* of Figs. 1 and 3. Fig. 4 is a vertical central section from front to rear. Fig. 5 is a vertical central section of the upper portion of said furnace as arranged for a low room. Fig. 6 is a perspective view of the combined exit and side flues. Fig. 7 is a vertical section of the same on the line *x' x'* of Fig. 6. Figs. 8, 9, 10, and 11 are vertical central sections of different forms or modifications of the side flues; and Figs. 12 and 13 are vertical central sections of the upper section of the furnace, showing modifications in the form and arrangement of the side flues and dome.

Letters of like name and kind refer to like parts in each of the figures.

My invention is an improvement upon a wood-burning heating-furnace for which Letters Patent No. 70,445 were granted me, November 5, 1867; and it consists, principally, in the peculiar form of the the vertical or side flues, substantially as and for the purpose hereinafter shown. It further consists in the employment of a diving exit-flue and a vertical side flue combined, substantially as and for the purpose set forth. It further consists in the peculiar construction of the additional or special side flues, substantially as and for the purpose hereinafter shown and described. It finally consists in the general construction and relative arrangement of its parts, whereby said furnace is adapted to the use of coal, substantially as is hereinafter specified.

In the annexed drawing, A represents the ash-pit, inclosed at its front side by means of a door, B, containing a draught-damper, C, and surmounted by a fire-pot, D, provided with a feed-chute, E, all of usual construction. The cover F of the combustion-chamber extends upward for a short distance from the fire-pot in nearly a vertical line; from thence extends horizontally

inward sufficiently to give a bearing for the side pipes, and from thence curves upward and inward so as to form a round-top dome, F'. Extending vertically upward from equidistant points around the horizontal portion of the cover F is a series of pipes or side flues, G, having a general triangular form, vertically, the lower open ends of which are placed over corresponding openings *f* provided in and through said cover, and within suitable inclosing packing-flanges *f'* that extend vertically upward from the same. Resting upon the upper ends of flues G is an annular flue, H, provided with openings *h* and packing-flanges *h'*, for the reception of the end of each flue, which openings and flanges correspond therewith, and are similar to those provided for the lower ends of said pipes. In order that the space between the side flues G may not be materially less at their inner than at their outer edges, their sides are formed upon horizontally-radial lines, so as to give to said flues a wedge-shape, as seen in Fig. 3. A straight pipe or flue, I, extending from side to side across the center of the annular flue H, and provided at its center with an opening, K, through which the heated escaping products of combustion pass from the heater to the chimney, completes the device, the operation of which is as follows:

The heated gases passing upward from the burning fuel are drawn to the outer side of the combustion-chamber and into the open ends of the side pipes, from whence, dividing, said currents pass upward in diverging lines to the vertical centers of said pipes, where, impinging against the converging sides of the same, their course is changed so as to cause them to unite at the upper ends of said flues, after leaving which said gases pass through the annular flue, the central arm, and the exit-flue into the chimney. The peculiar shape of the side flues gives to them the largest possible radiating surface, and as, from their relative arrangement, the external air has free access to every portion of the same, so large a percentage of the heat of the escaping products of combustion is withdrawn therefrom and communicated to the surrounding air that the temperature of said escaping gases upon entering the chimney is sufficient only to give to the air contained therein the necessary upward motion to insure a perfect draught. As hereinbefore shown, the exit-flue K extends up-

ward from the cross-flue I; but, as the limited space within a furnace-room frequently renders such an arrangement impracticable, it has been found necessary to provide a similar opening, K, within the lower side of said flue I, and connect therewith a pipe, L, that from thence extends in a curve downward and radially outward, and enters the chimney at or near the upper end of the furnace. From its size it would be impracticable for the pipe L to pass between two of the side pipes G, or to occupy the space allotted to one of the same, while if two of said pipes were omitted the radiation of heat from that point would be lessened, and a space left within the annular flue H upon which ashes would lodge so as to obstruct the draught. To obviate these objections, it has been found advantageous to combine one of said side flues (without its central opening) with said pipe L, as seen in Fig. 5, and to place upon either side of the same single flues G', constructed without the usual inner angular branch, by which arrangement the uniformity of exterior appearance and of radiating surface is preserved, and the free circulation of air around and between said parts is unimpeded. From its peculiar angular shape the diamond flue is believed to utilize a larger percentage of the heat of the escaping products of combustion than though said angles were omitted and curved lines substituted, (as shown in Fig. 8,) as the diverging currents of gas, when suddenly caused to converge, impinge with considerable force against the outer wall of the flue, and impart to the same a higher temperature than would otherwise be attainable; but it will be readily seen that the principle of operation would be the same with each form, the only difference being that of degree. If desired, the expense of the side flues may be materially decreased by omitting the central opening for external air, and inserting a horizontal diaphragm, g', (as shown in Fig. 10,) so as to divide the current of heated gases, or (as seen in Fig. 11) a like result could be obtained by the employment of a **A**-shaped diaphragm, g"; but, while in either case the cost of constructing said flues would be considerably reduced, it is be-

lieved that their heating capacity would be correspondingly diminished.

In Figs. 12 and 13 are shown two furnaces constructed with the single side flues G', in which the dome or cover of the combustion-chamber is enlarged, so as to cause it to nearly fill the space between said flues, whereby a corresponding increase in its radiating-surface is obtained, and the omission of the inner branch of said flues in a great measure compensated for.

The especial advantage obtained by my construction of a heating-furnace is that, while possessing an unusually large radiating-surface, its flues are self-cleaning, or rather are so formed as to prevent ashes from lodging therein, but cause the same to fall downward into the fire-pot, by which means but slight attention is required in the operation of said furnace, and its heating capacity is unimpaired by use.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. The side flues G, provided with diverging and converging passages, and having their vertical sides formed upon lines diverging horizontally from a common center, so as to give to said flues a general wedge-shape in plan view, substantially as and for the purpose specified.
2. The exit-flue L and side flue G, when combined in the manner and for the purpose substantially as shown and described.
3. The single side flues G', substantially as and for the purpose set forth.
4. The side flue G, provided with the diaphragm g' or g'', substantially as and for the purpose shown.
5. The general construction and relative arrangement of the fire-pot D, the dome F, the side pipes G, and the annular flue H, substantially as and for the purpose specified.

In testimony that I claim the foregoing I have hereunto set my hand this 1st day of June, 1871.

JAS. A. LAWSON.

Witnesses:

GEO. A. WELLS,
CHAS. H. HAZARD.