

(No Model.)

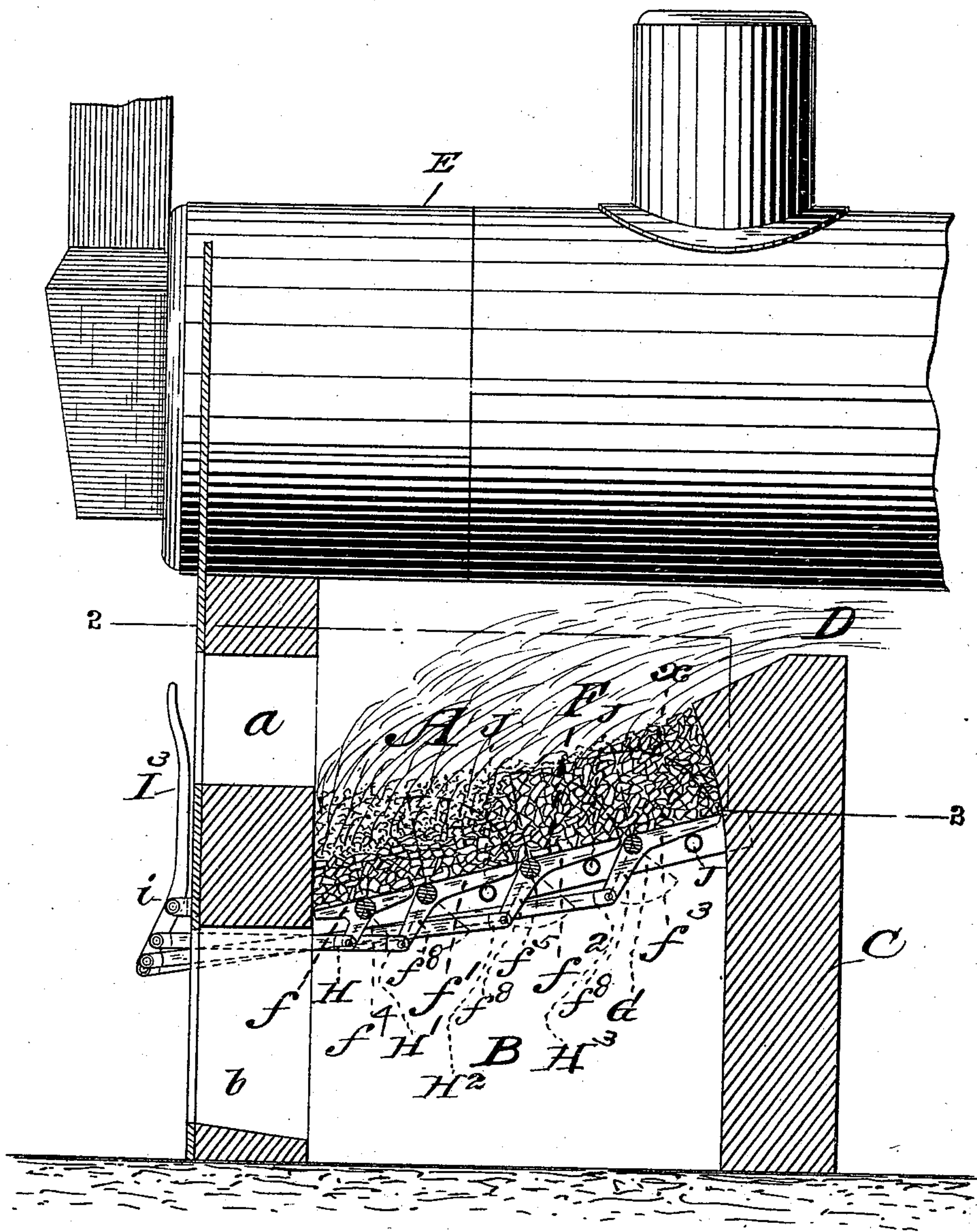
M. C. HAWLEY.  
FURNACE.

2 Sheets—Sheet 1.

No. 488,893.

Patented Dec. 27, 1892.

*Fig. 1.*



WITNESSES  
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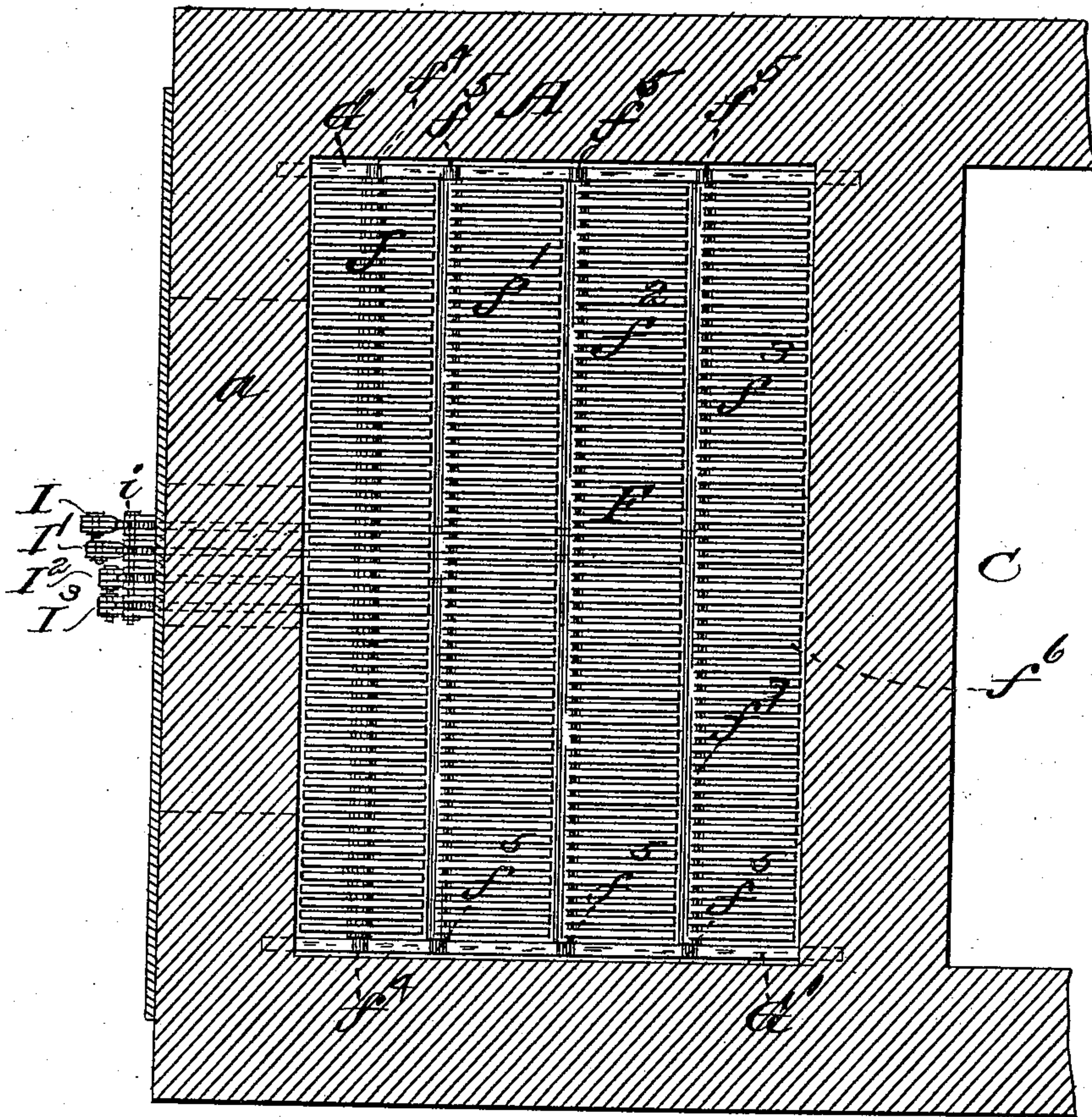
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2 Sheets—Sheet 2.

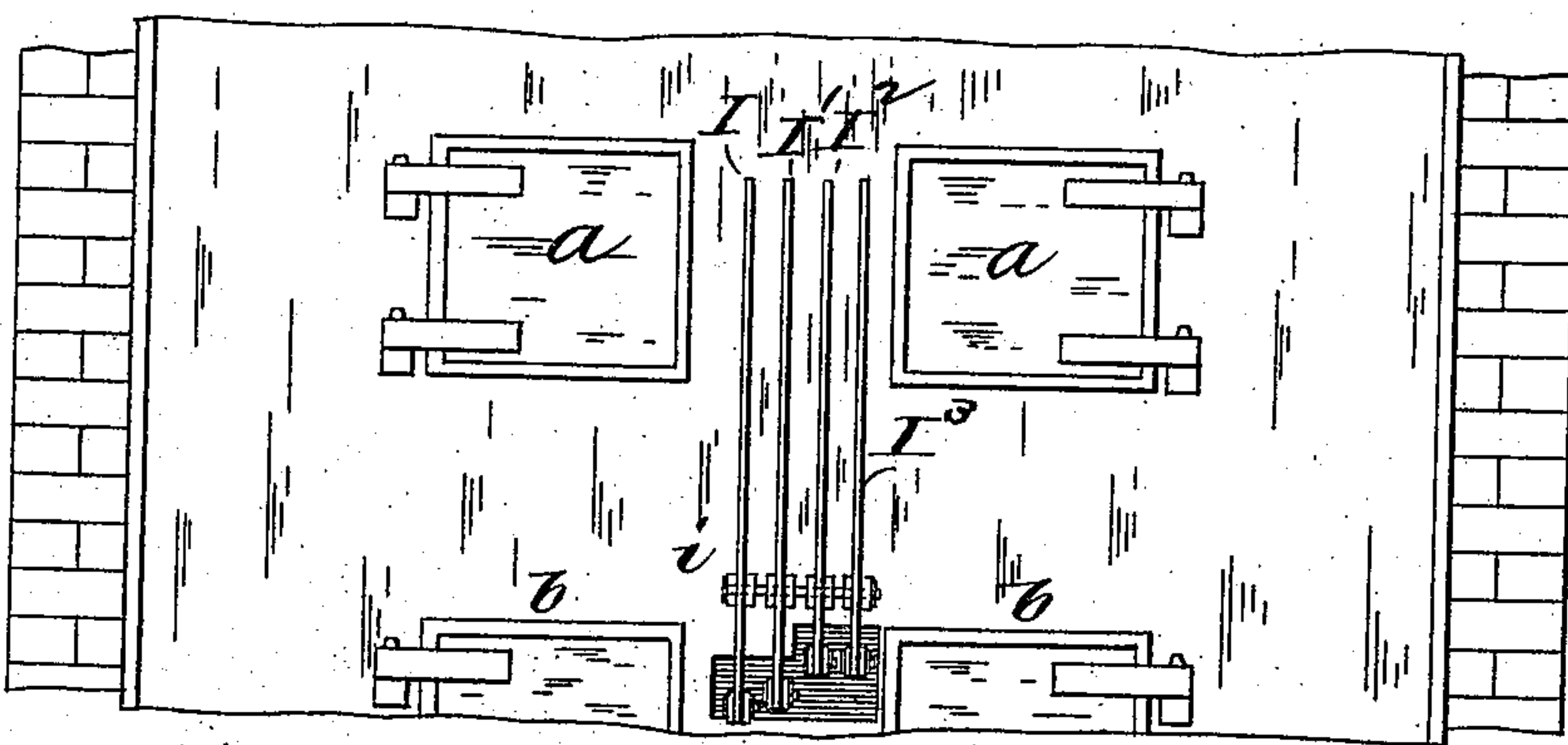
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*Fig. 2.*



*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

MELVILLE C. HAWLEY, OF ST. LOUIS, MISSOURI.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 488,893, dated December 27, 1892.

Application filed March 15, 1892. Serial No. 425,012. (No model.)

*To all whom it may concern:*

Be it known that I, MELVILLE C. HAWLEY, of St. Louis, Missouri, have made a new and useful Improvement in Furnaces, of which the following is a full, clear, and exact description.

The improvement under consideration is adaptable to various forms of furnaces, and especially to steam boiler furnaces, and it is in connection with such a furnace that it is illustrated. The furnace is designed for carrying out the following method of firing: the grate, from the front to the rear end thereof, is filled with fuel and a fire is started just within the doorways in the upper part of the body of fuel. Under the influence of the draft, the fire extends along the top portion of the body of fuel to the farther end of the fireplace. The air needed for the combustion is supplied mainly, if not entirely, from beneath the grate, and, ascends through the grate and then through the interstices in the body of unburned fuel until it reaches the stratum of burning fuel; the fuel consumes downward gradually until, finally, all the fuel remaining upon the grate has become incandescent; the grate is then manipulated so that such incandescent fuel is concentrated at the forward end of the furnace, leaving the remaining portion of the furnace empty, such empty portion is now refilled with fuel and the operation of the furnace continues; the fire spreads from the forward end of the furnace backward as before, igniting the top portion of the fuel throughout the length of the furnace, and after this the fuel consumes downward as before, and after another remnant of the fuel remaining upon the grate has become incandescent the operation of concentrating the fuel at the forward end of the furnace is repeated, and so on. That is, the present furnace is an upward draft one, and owing to the described manner of burning the fuel, namely, starting the fire at the forward end of the furnace and allowing it to gradually ignite the fuel beyond and beneath it, the fuel is very thoroughly consumed as well as the smoke. To this end, and as the most desirable means for carrying out the above described mode of firing, the grate is made in sections. The sections are arranged crosswise in the furnace, and successively one beyond another

and while they unitedly constitute a grate they are adapted to be independently, rotated or upturned, or otherwise adjusted, all, substantially as is hereinafter set forth and claimed, aided by the annexed drawings, making part of this specification, and exhibiting a desirable mode of carrying out the improvement, and in which—

Figure 1 is a vertical longitudinal section of the improved furnace, a boiler being shown in side elevation: Fig. 2 a horizontal section on the line 2—2 of Fig. 1: and Fig. 3 a front elevation of the furnace.

Only a sufficient portion of the construction for an understanding of the improvement is exhibited in the various views of the drawings.

The same letters of reference denote the same parts.

The furnace, A, is of any of the usual forms saving as modified or supplemented by the present improvement. Its doorways through which the fuel is introduced are shown at *a a*.

B represents the ash-pit having doorways *b, b*; the bridge wall is shown at C; the escape flue from the furnace is at D, and E represents an ordinary boiler in position above the furnace.

F represents the grate. It is made in sections *f, f', f<sup>2</sup>, and f<sup>3</sup>*. Only four sections are shown, but the grate can be extended longitudinally, and any number of sections employed, as may be desirable. The first section, *f*, is a dumping grate, and is provided with journals *f<sup>4</sup>*, which are held in bearings in suitable supports such as the bars G, G'. The remaining sections are also journaled to enable them to be rotated, and for this purpose are each provided with journals, *f<sup>5</sup>*, which are suitably sustained, and preferably in the bars G, G'. Said sections, *f', f<sup>2</sup>, f<sup>3</sup>*, however, are not designed to dump the fuel into the ash pit beneath the grate, but onto each other successively, and ultimately onto the first section *f*. Accordingly the sections are arranged closely together, with their journals in the immediate vicinity of the rear edge of the section in front, and the section, when rotated, is turned to cause its rear edge to rise and, in practice, until the section has assumed a substantially-vertical position, or so as to cause its load to be delivered onto that portion of



the grate which is in front of it. The movement is indicated by the broken lines  $x$ , Fig. 1. The farthest section  $f^3$ , is rotated first and its contents are thereby transferred onto the next section,  $f^2$ ; that section is then upturned and the fuel thereon in consequence transferred onto the next section  $f'$ , which, in turn, is similarly operated and all of the fuel remaining in the furnace is thereby transferred onto the section  $f$ .

The sections,  $f'$ ,  $f^2$ ,  $f^3$ , preferably each consist mainly of a series of longitudinal bars  $f^6$  attached to a cross-bar  $f^7$ , and, to provide for operating the sections as described, each section is furnished with an arm  $f^8$ , and the various arms, by means of the rods,  $H$ ,  $H'$ ,  $H^2$ ,  $H^3$ , respectively, are jointed to the levers  $I$ ,  $I'$ ,  $I^2$ ,  $I^3$ , respectively. Said levers may be arranged at the front of the furnace as shown, or elsewhere as preferred. They are pivoted at  $i$ , and by turning a lever upward or downward on its pivot the grate section belonging to that lever is accordingly moved. The cross-bars  $J$ , serve to hold the sections  $f'$ ,  $f^2$ ,  $f^3$ , in position to sustain the fuel. The section,  $f$ , has its journals preferably at the center of its ends, and it thus can be readily held and operated as desired.

I desire not to be restricted to any special form of grate-section, or mode of combining or sustaining, the sections, so long as they can coact in substantially the manner described. The grate, as an entirety, is preferably inclined, its rear end being the higher one substantially as shown. Although the fuel consumes from its surface downward toward the grate the furnace, as indicated in Fig. 1, is an upward-draft one.

I claim:—

1. In a furnace, a grate made in sections arranged crosswise, and successively beyond each other, in the furnace, and each being pivoted at or near its upper front corner to enable the sections, beginning at or toward the rear end of the furnace, to be separately and successively upturned for the purpose of accumulating the contents of the grate at or toward the forward end of the furnace, substantially as described.

2. A furnace grate made in sections which are arranged transversely, and successively beyond each other, in the furnace, and which are pivoted, and relatively arranged, to enable the sections to be separately upturned toward the front of the furnace, and when

upturned, to be in position to dump their contents onto the section next in front, substantially as described.

3. The combination, in a furnace, of the grate-sections and the cross-bars  $J$ , said grate sections being arranged crosswise in the furnace, and being pivoted respectively at or near the upper forward corner of the section, substantially as described.

4. The combination, in a furnace, of the grate-sections  $f$ ,  $f'$ ,  $f^2$ ,  $f^3$ , the rods, and the levers, said section  $f$ , being adapted to be turned to dump its contents into the ash-pit, and said other sections each being pivoted at or near the upper forward corner of the section to enable them to be separately upturned toward the front of the furnace, and into position to dump their contents onto the section next in front as described.

5. The herein described method of firing a furnace, the same consisting in filling the grate with fuel, starting a fire therein at the forward end of the body of fuel, extending the fire along the top portion of the fuel to the farther end of the fireplace, consuming the fuel downward toward the grate, concentrating the remnant of the fire at the forward end of the fireplace, refilling the empty portion of the grate with fuel, and extending the fire backward again along the top portion of the fuel, and repeating as set forth.

6. The herein described method of firing a furnace, the same consisting in consuming the fuel downward toward the grate, concentrating the remnant of the fire at the forward end of the fireplace, refilling the empty portion of the grate with fuel, and extending the fire backward again along the top portion of the fuel, and repeating as set forth.

7. The herein described method of firing an upward-draft furnace, the same consisting in consuming the fuel from the surface thereof downward toward the furnace grate, concentrating the remnant of the fire at one part of the grate, refilling the grate with fuel, extending the fire throughout the upper portion of the fuel, and then consuming it downward again toward the grate, and so on.

Witness my hand this 11th day of March, 1892.

MELVILLE C. HAWLEY.

Witnesses:

C. D. MOODY,  
A. BONVILLE.