

(No Model.)

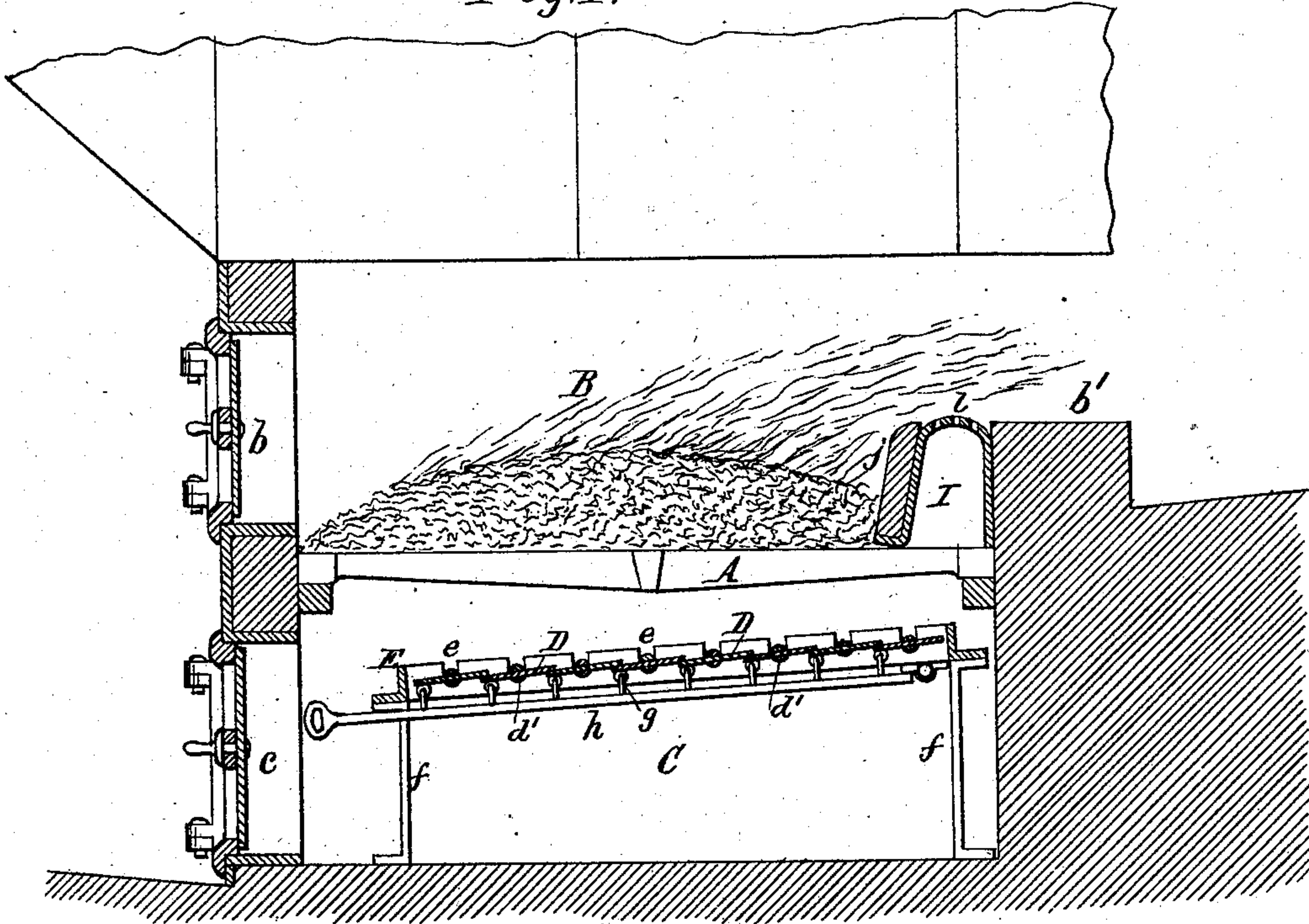
2 Sheets—Sheet 1.

U. CUMMINGS.  
FURNACE.

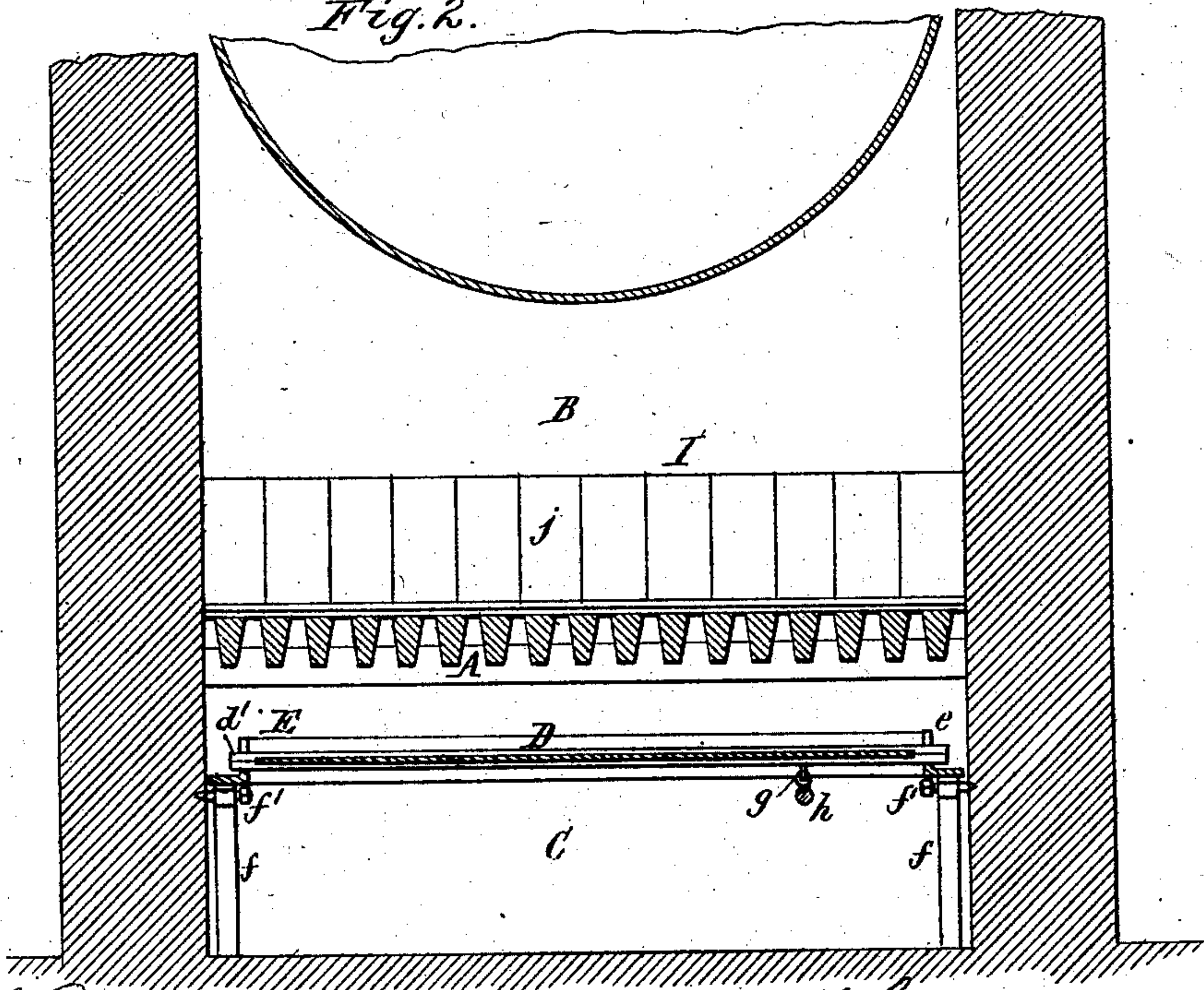
No. 289,990.

Patented Dec. 11, 1883.

*Fig. 1.*



*Fig. 2.*



*Edw. J. Brady  
Theo. H. Popp*

*Witnesses.*

*U. Cummings Inventor.  
By Wilhelm Rönner  
Attorneys.*

(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

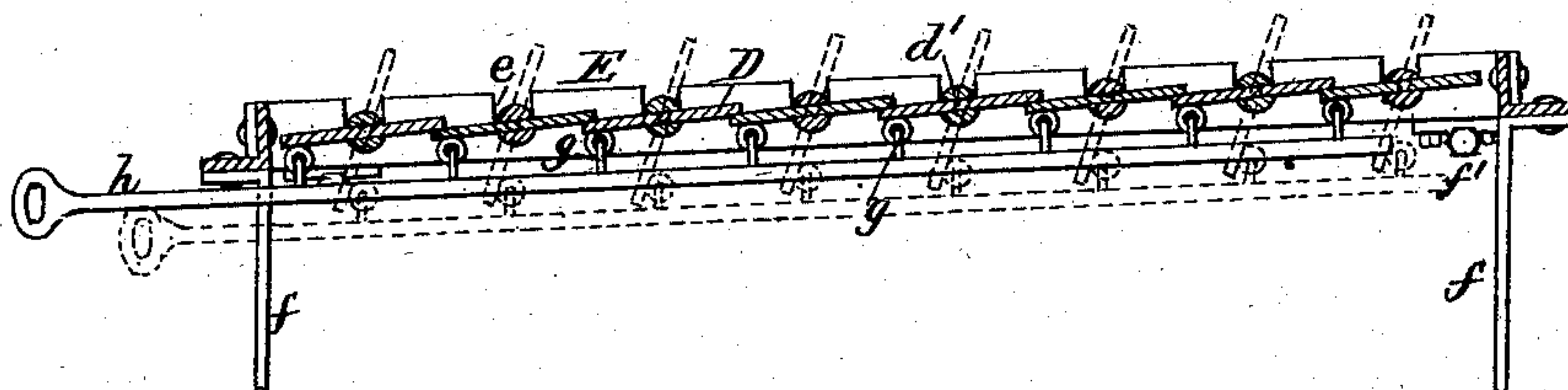


Fig. 4.

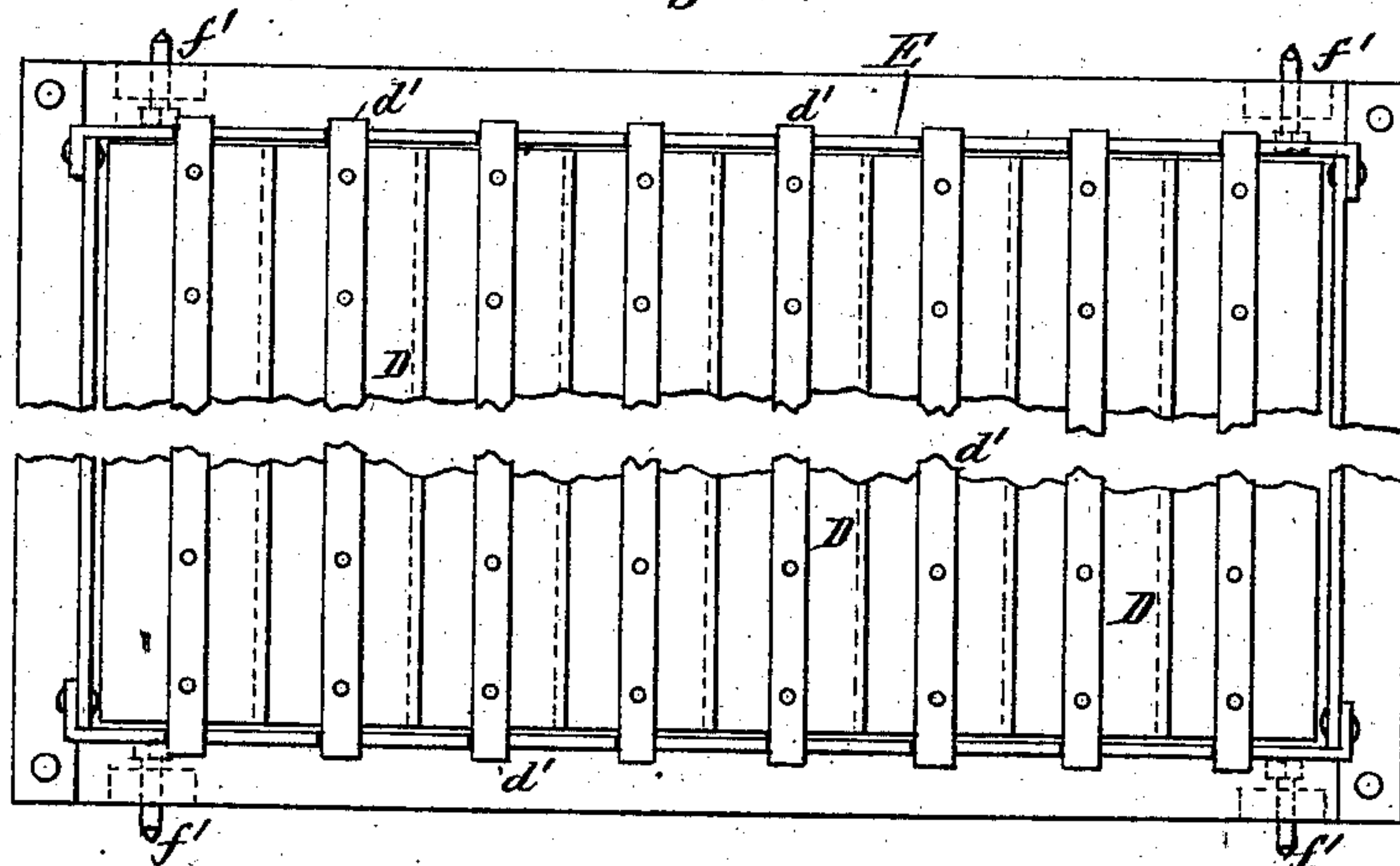


Fig. 5.

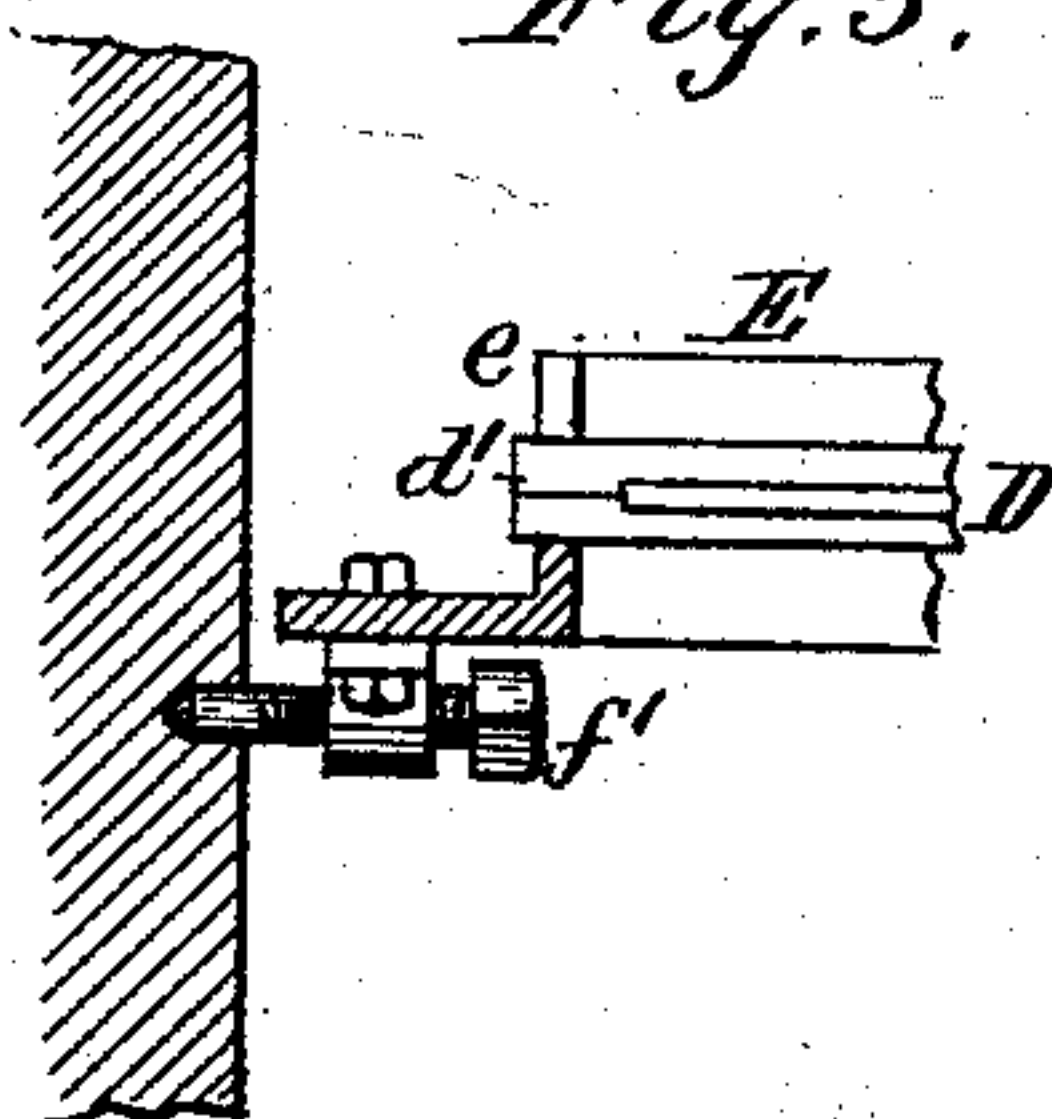


Fig. 6.

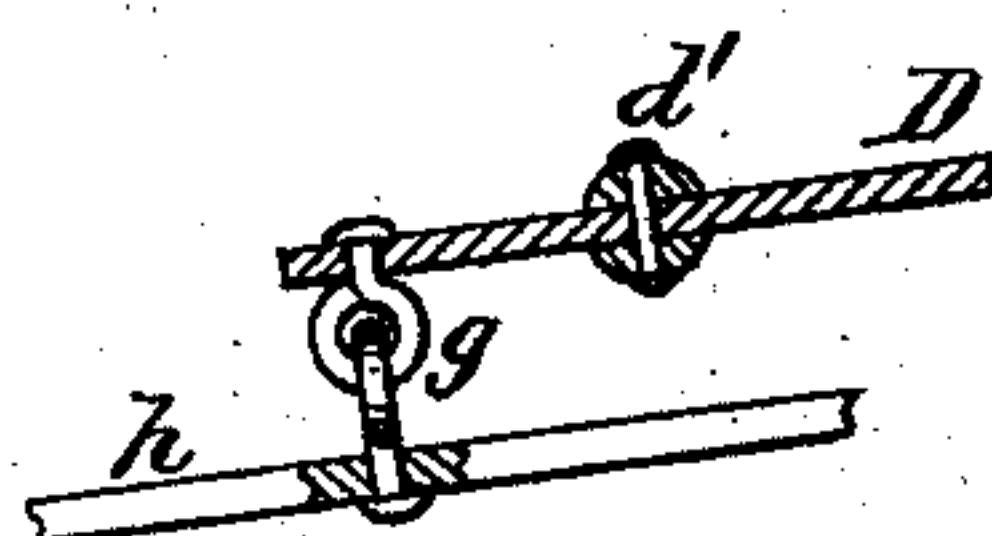
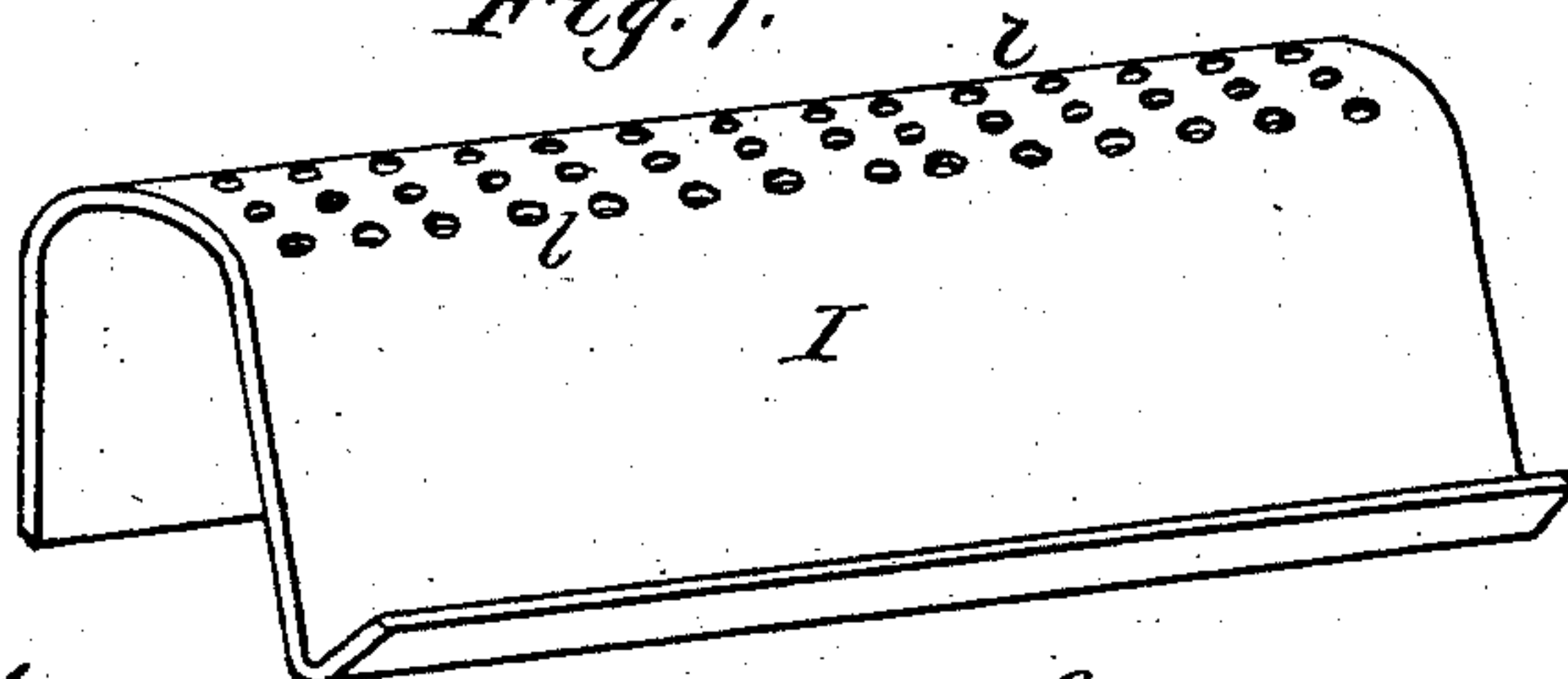


Fig. 7.



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Theo. L. Popp.

Witnesses.

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# UNITED STATES PATENT OFFICE.

URIAH CUMMINGS, OF BUFFALO, NEW YORK.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 289,990, dated December 11, 1883.

Application filed February 23, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, URIAH CUMMINGS, of the city of Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to an improvement in boiler and other furnaces, whereby the combustion of the fuel is rendered more perfect and the formation of smoke is to a large extent prevented.

It is well known that in furnaces constructed in the ordinary manner large volumes of combustible gases are developed, which escape without being consumed, and which not only involve a heavy loss of fuel, but also materially increase the volumes of smoke which are produced by the furnace. It is also well known that these combustible gases can be consumed and the combustion rendered more perfect by admitting fresh air to the furnace at a point where it can be combined with these combustible gases, and that the desired result is most perfectly attained when hot air is so admitted to the furnace, because chilling effects, due to the admission of large volumes of cold air to the furnace above the grate, are thereby avoided.

The object of my invention is the construction of a simple and cheap device whereby the heated air can be commingled with the combustible gases generated by the burning fuel on the grate, such device being so constructed that it can be readily applied to furnaces of ordinary construction already in existence; and my invention consists, to that end, of the peculiar construction of the device, which will be hereinafter fully set forth, and pointed out in the claim.

In the accompanying drawings, consisting of two sheets, Figure 1 represents a longitudinal section of a furnace provided with my improvements. Fig. 2 is a cross-section of the same. Fig. 3 is a longitudinal section, on an enlarged scale, of the air-heating contrivance arranged below the grate. Fig. 4 is a fragmentary top plan view of the same. Fig. 5 is a cross-section of the frame of the air-heating contrivance. Fig. 6 is a longitudinal section, on an enlarged scale, of one of the adjusting-

plates of the same. Fig. 7 is a perspective view of the metallic portion of the air-heating contrivance which is arranged above the grate.

Like letters of reference refer to like parts in the several figures.

A represents the grate of a steam-boiler or other furnace; B, the combustion-chamber above the grate; *b*, the fire-door; *b'*, the bridge-wall; C, the ash-pit, and *c* the ash-pit door, all of any suitable and well-known construction.

The air-heating contrivance arranged below the grate in the ash-pit C is composed of a series of metallic plates or slats, D, which are arranged in such close proximity to the grate that the heat which is radiated downwardly by the burning fuel on the grate is partly absorbed and partly reflected by the plates D, and imparted by the latter to the air which enters from the ash-pit into the space between the grate and the plates D. The plates D are constructed with journals *d'*, which rest in notches *e*, formed in side bars, E, of a frame which is arranged in the ash-pit, and which supports the plates D. The frame E is supported by standards or legs *f*, and secured in place by set-screws *f'*. The plates D extend as far as practicable across the entire width of the ash-pit, so as to prevent as much as possible the air from entering the space between the plates D and the grate, except through the opening at the front end of the furnace. The plates D are connected by suitable hooks, *g*, with a longitudinal bar, *h*, whereby all the plates can be turned simultaneously on their journals, thereby enabling the plates to be placed with their flat sides toward the grate, as represented in Fig. 1, or with their edges toward the grate, as represented by dotted lines in Fig. 3.

I represents an air-heating chamber arranged upon the grate against the bridge-wall *b'*, and open at its lower end, so that a portion of the air passing upwardly between the grate-bars enters the chamber I. The latter is provided at its top with perforations or slots *l*, through which the air passes from the chamber I into the flame-space of the furnace.

The chamber I is constructed of cast-iron or other suitable material, and its front side,



against which the fuel rests, is protected by a covering, *j*, of fire-brick or other refractory material.

When the furnace is in operation, the cold  
5 air passes from the ash-pit C into the space  
between the plates D and the grate A, and a  
portion of the air passes upwardly through  
the space between the grate-bars in front of  
the hot-air chamber I, while the remaining  
10 portion of the air, after having passed through  
the space between the grate A and the plates  
D, passes into the chamber I. The plates D  
become highly heated by the heat which is  
radiated downwardly by the burning fuel on  
15 the grate, and the air in passing over the plates  
D becomes highly heated before it passes up-  
wardly between the grate-bars and into the  
combustion-chamber. The air which enters  
the hot-air chamber I has passed over the en-  
20 tire series of plates D, and has thereby become  
highly heated, and this air is further heated  
by contact with the hot walls of the chamber  
I, so that the air which issues into the flame-  
space through the openings *l* is heated to such  
25 a degree that it is in the best possible condi-  
tion to combine with the combustible gases  
generated by the fuel. This hot air combines  
readily with the combustible gases and com-  
pletes the combustion thereof, thereby insur-  
30 ing a perfect combustion and a correspond-  
ingly high degree of heat, and preventing the  
formation of smoke. The air which is sup-  
plied to the grate and to the flame-space of  
the furnace is by this means heated by that  
35 portion of the radiated heat which is wasted  
in ordinary furnaces, and the heat which is  
required for raising the temperature of the air

does not therefore reduce the temperature of  
the furnace. When a layer of ashes has ac-  
cumulated on the plates D which would in-  
40 terfere with the operation of heating the air  
by contact with these plates, the latter are  
turned on their pivots so as to assume the po-  
sition represented by dotted lines in Fig. 3,  
45 whereby the ashes are dumped into the ash-  
pit, when the plates are returned to their for-  
mer position.

If desired, a stationary plate or plates may  
be substituted for the movable plates D; but  
I prefer to employ the movable plates, because  
50 a stationary plate or plates would necessitate  
the raking out of the ashes, which I desire to  
avoid.

The air-heating contrivance arranged below  
the grate and the air-heating chamber ar-  
55 ranged above the grate are both very simple  
in construction, and can be readily applied to  
furnaces of ordinary construction without ne-  
cessitating alterations in the furnace.

I claim as my invention—

60 The combination, with a furnace-grate, A,  
and ash-pit C, of pivoted air-heating plates ar-  
ranged below the grate and above the bottom  
of the ash-pit, with an opening for admitting  
the air into the space above the air-heating  
65 plates, and mechanism, substantially as de-  
scribed, whereby the pivoted plates can be  
simultaneously turned on their pivots for dis-  
charging the ashes, substantially as set forth.

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Witnesses:

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