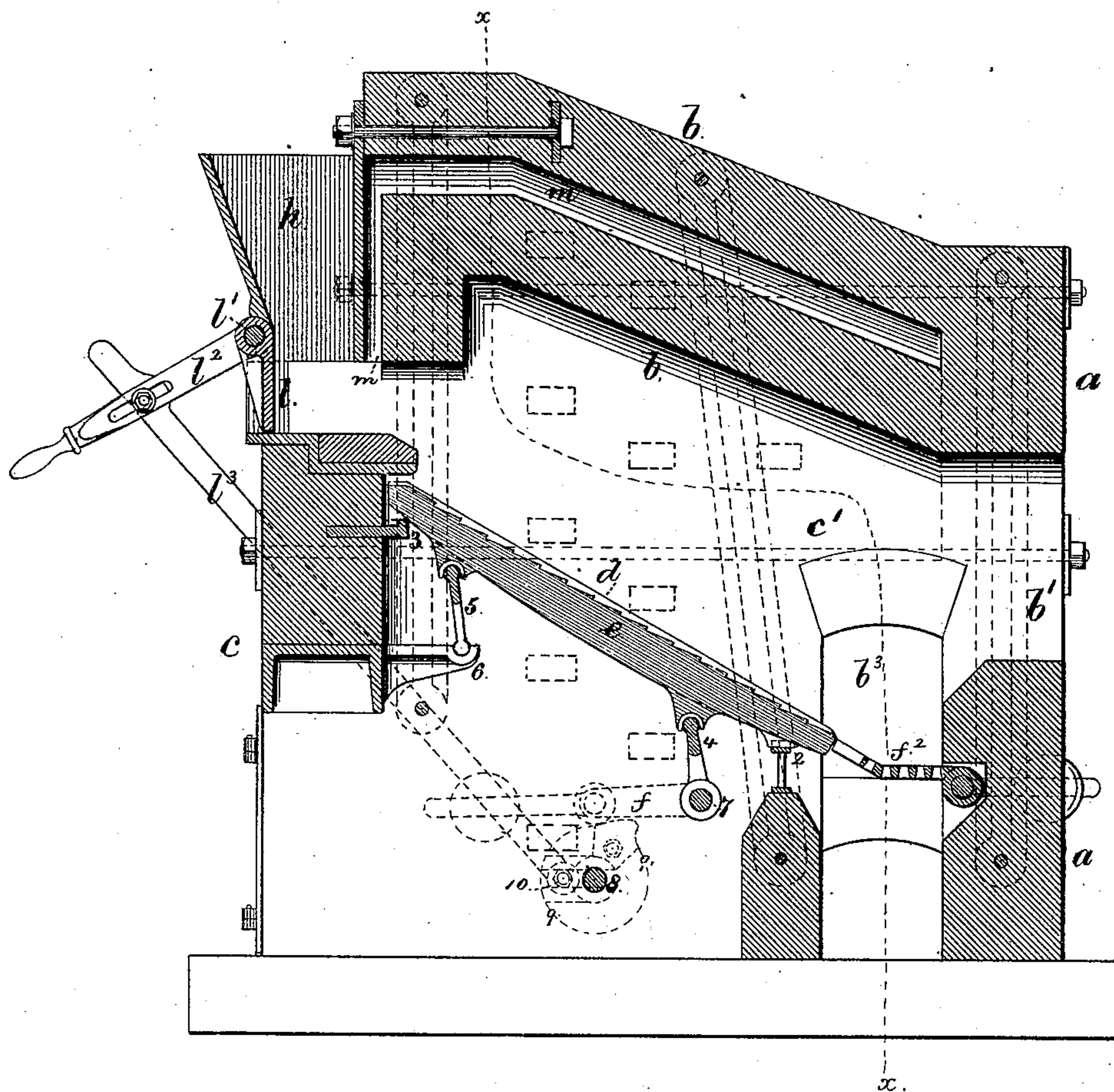


J. B. HOYT.  
Furnaces.

No. 155,377.

Patented Sept. 29, 1874.

Fig. 1.



Witnesses

Chas H. Smith  
Carold Terrell

Inventor

Joseph B. Hoyt.  
per Lemuel W. Terrell

att'y

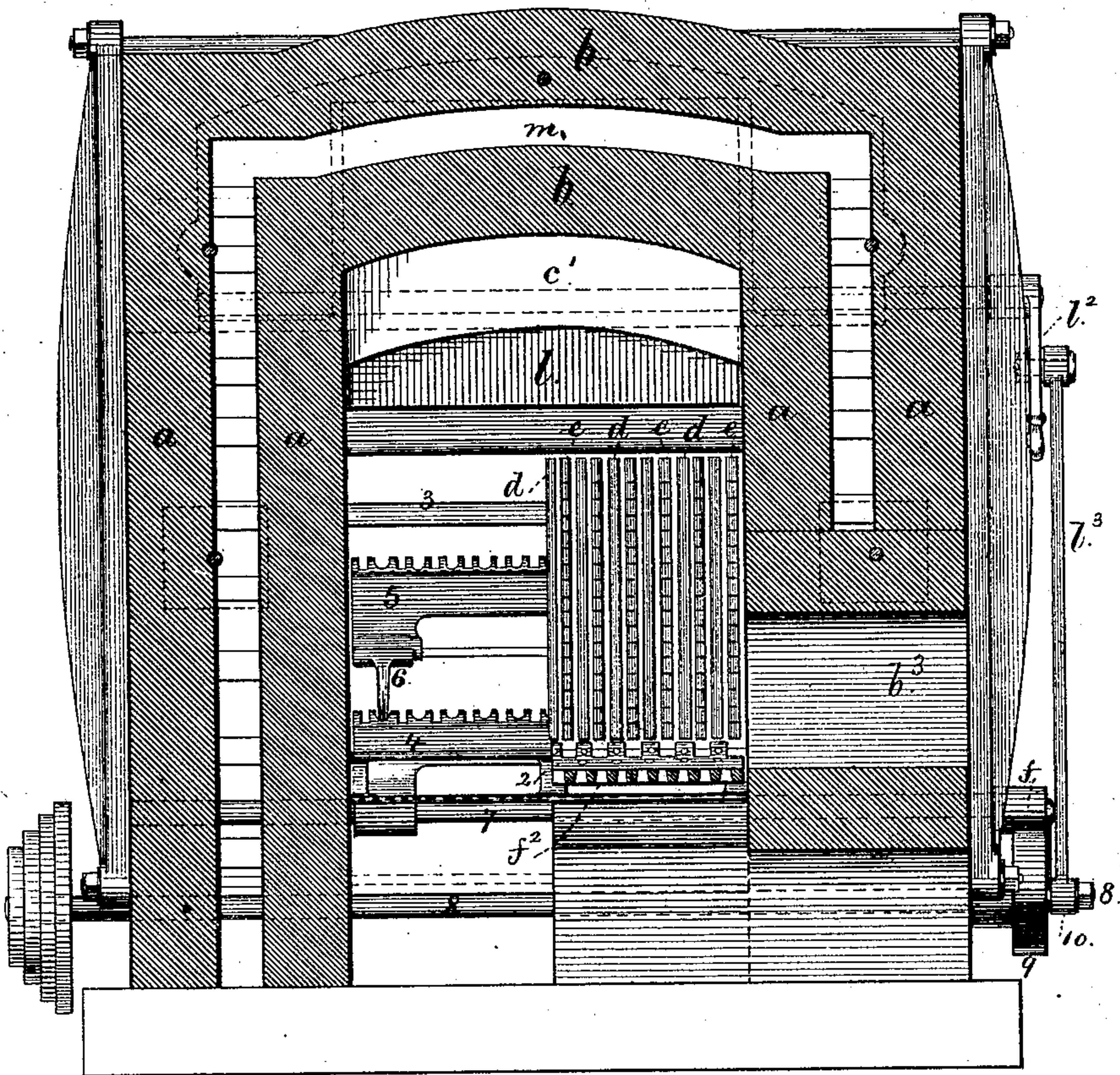


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Fig. 2.



Witnesses

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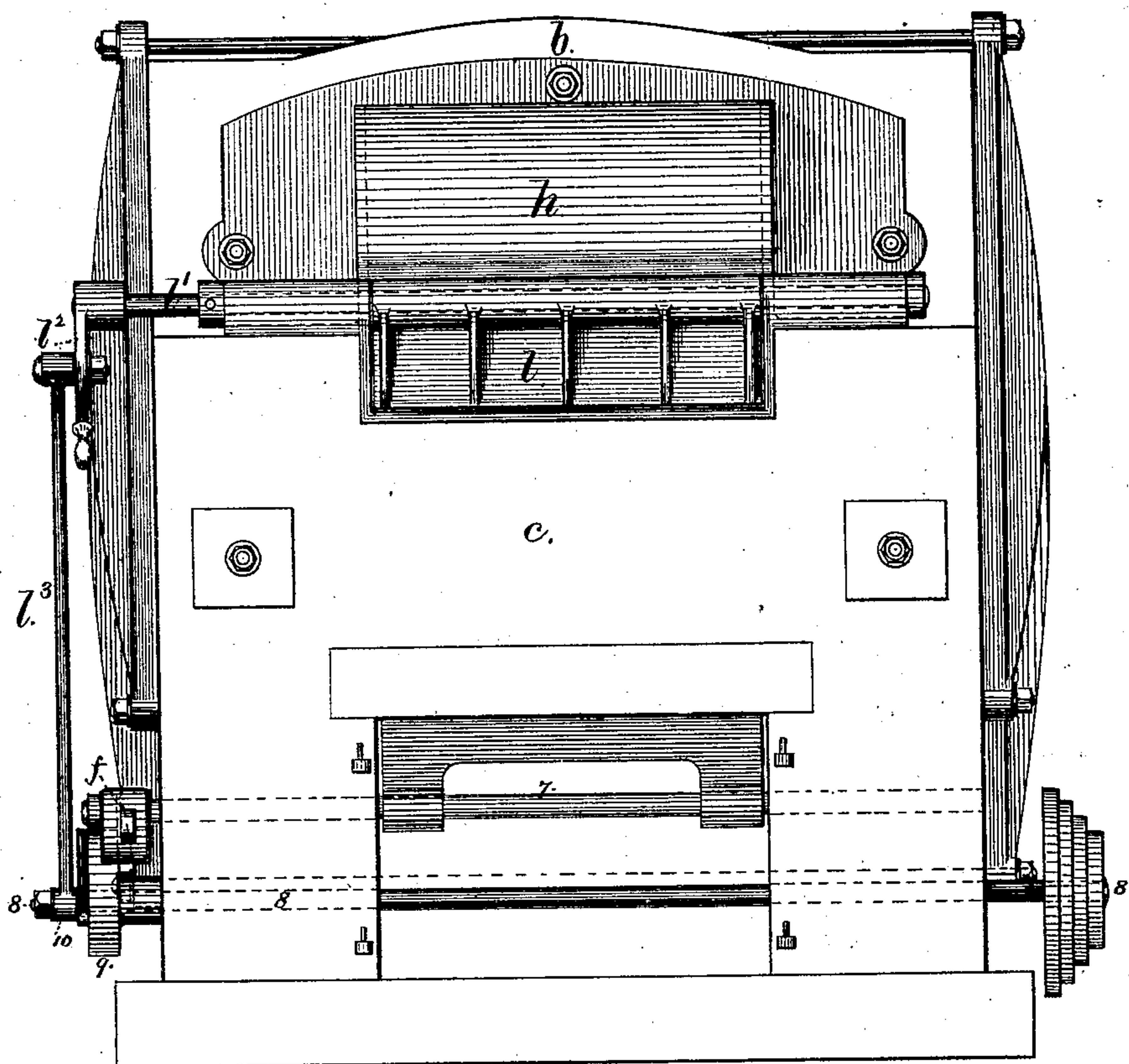
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Fig. 3.



Witnesses

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Fig. 4.

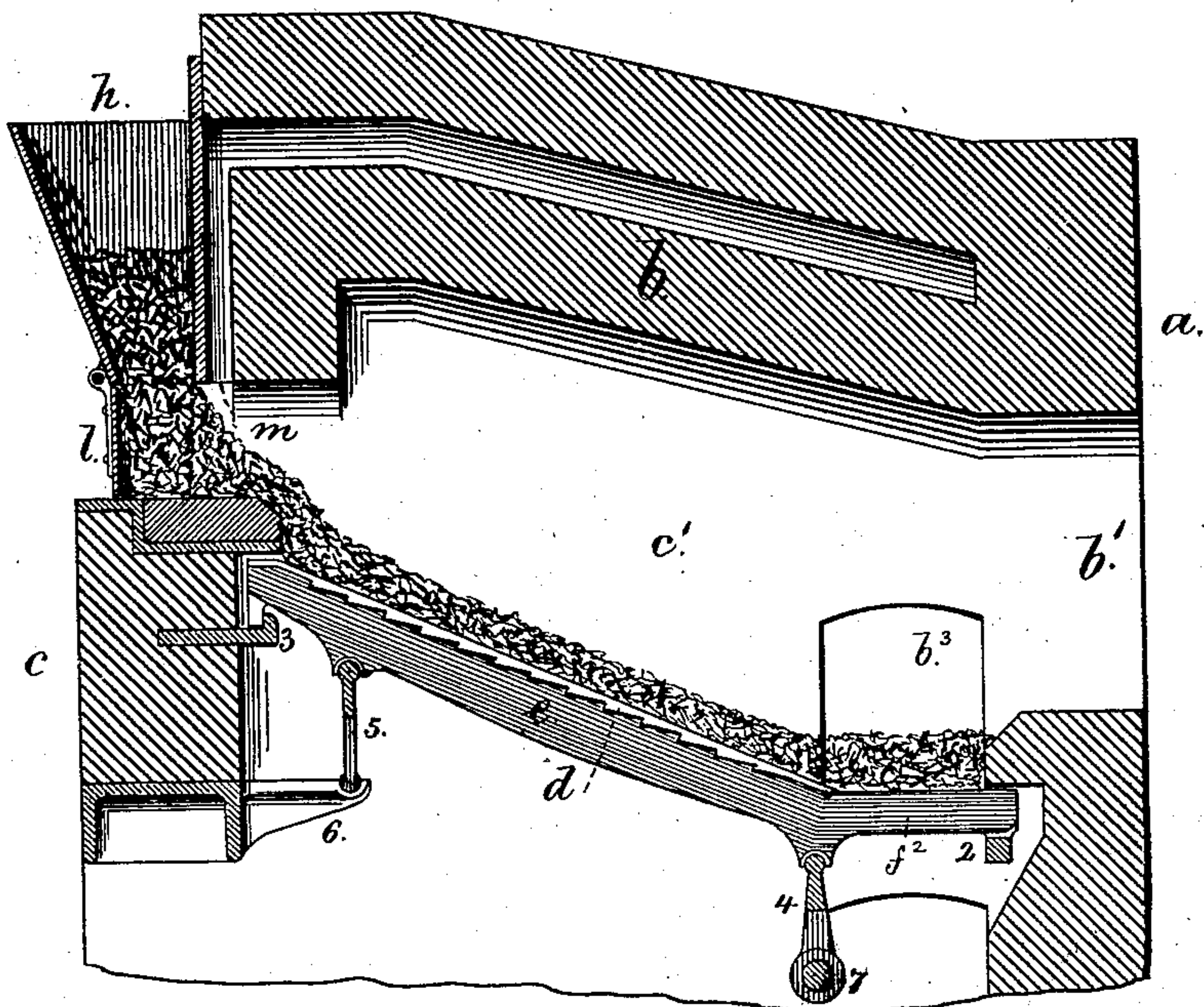
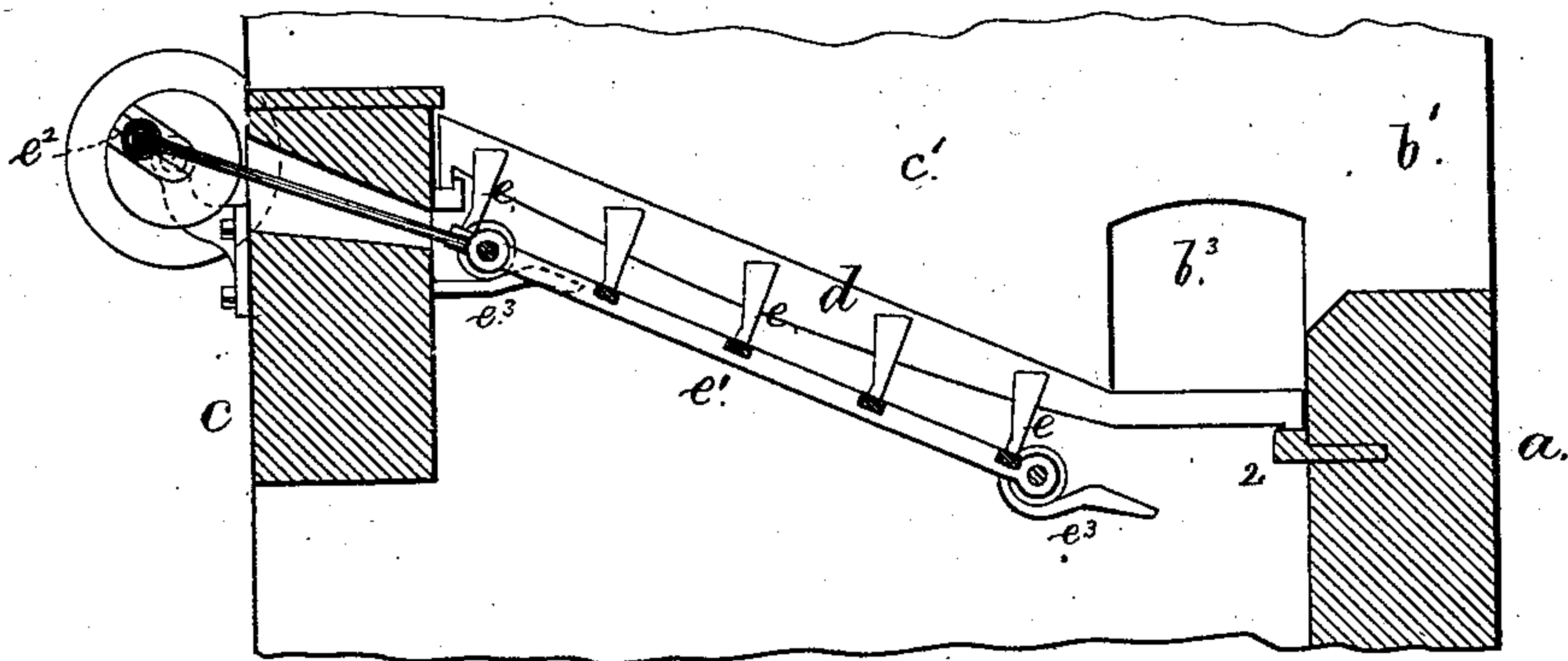


Fig. 5.



Witnesses

Chas H Smith  
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Inventor

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per Lemuel W. Ferrell  
att



# UNITED STATES PATENT OFFICE.

JOSEPH B. HOYT, OF STAMFORD, CONNECTICUT.

## IMPROVEMENT IN FURNACES.

Specification forming part of Letters Patent No. **155,377**, dated September 29, 1874; application filed June 9, 1874.

*To all whom it may concern:*

Be it known that I, JOSEPH B. HOYT, of Stamford, in the county of Fairfield and State of Connecticut, have invented an Improvement in Furnaces, of which the following is a specification:

In Letters Patent No. 99,570 granted to me a provision is made for supplying fuel to a furnace and for admitting atmosphere above the fuel into the fire-chamber.

The present invention is an improvement upon and modification of the aforesaid invention, and is made with special reference to introducing the fuel automatically and for causing the fuel to move progressively from the point of supply to that of ultimate consumption, so that the clinker does not remain in one place, but is moved forward, and does not obstruct combustion, and that which ultimately remains is dumped or removed. The fuel is supplied in small quantities and frequently, so as to prevent the sudden development of large volumes of gases, and the fuel is moved along upon the grate-bars progressively and automatically and the fire stirred sufficiently to shake out ashes. A regular supply of atmosphere is admitted both above and below the fire, and the atmospheric air admitted above the fuel is heated by passing through the hollow furnace-walls, so that the escape of heat is prevented, and combustion is promoted by the air that passes into the fire being sufficiently heated to combine freely with the gases developed from the fuel.

In the drawing, Figure 1 is a longitudinal section of the furnace complete. Fig. 2 is a cross-section of the same at the line *xx*, with some of the grate-bars removed. Fig. 3 is a front elevation. Figs. 4 and 5 represent, by longitudinal sections, the furnace in a modified form.

The furnace is made with side walls *a a*, top arch *b*, front walls *c*, and exit or opening at *b'* for the products of combustion to pass from the chamber *c'* to a boiler or other article to be heated. Within the furnace are inclined grate-bars, separating the ash-pit from the combustion-chamber, and these bars are composed of two sets, one set, *d*, being stationary, and the other set, *e*, being movable and acting between the bars *d* to move the fuel along and down

the incline, and at the same time to agitate the fuel and shake out the dust and ashes. The stationary bars *d* are shown as supported at the lower end by the cross-bearer 2, and at the upper end as resting upon the bearer 3. The moving bars *e* are shown in Fig. 1 as supported upon the swinging cross-bearers 4 and 5, the upper one of which rests at its ends in supports 6, and the lower one is provided with a shaft, 7, that extends through the furnace-wall, and is made with a lever-arm, *f*, and counter-weight, and a shaft, 8, that is revolved slowly by competent power, and the cam 9 upon such shaft acts to raise the arm *f* and swing the grate-bars *e* toward the bars *f*<sup>2</sup> and raise them up through the stationary bars *d* sufficiently to press the fuel along such inclined bars, and down them toward the rear end of the furnace, thereby lifting the fuel and shaking the same to crack up the coke of bituminous coal and to remove the dust.

It is generally preferable to employ a cam that is sudden in its operation, and also to use teeth on the surfaces of the movable bars, as represented, so as to aid in moving the fuel, and the flat grate *f*<sup>2</sup> at the lower end of the incline may be made to drop for the delivery of clinkers, as in Fig. 1. On this flat portion may be an extension at the lower ends of the inclined bars *e*, as in Fig. 4, or of the bars *d*, as in Fig. 5. The moving bars *e* may be supported by a frame, *e*<sup>1</sup>, Fig. 5, that is moved endwise by the crank *e*<sup>2</sup> and connecting-rod, and this frame is made with rollers resting upon the inclined supports *e*<sup>3</sup>, so that the frame and bars are lifted and the bars press against the fuel, to lift and stir the same and move it forward down the inclined grates.

These operations are very important, especially with bituminous coal, as the tendency of such coal is to coke and prevent the atmosphere passing freely through the fire. With my improvements the coke is so often lifted, agitated, and broken that the air passes through freely.

The fuel is placed in the hopper *h*, and if it is anthracite coal the same will run down gradually, as the mass is agitated upon the grate, and pass down the incline thereof, as illustrated in Fig. 4; but when bituminous coal is employed it is necessary to press the fuel forward into the furnace. This is accomplished by the feed-plate



*l* that is hung from a shaft, *l*<sup>1</sup>, to which a motion is given periodically by the lever *l*<sup>2</sup>, connecting-rod *l*<sup>3</sup>, and crank 10 upon the shaft 8, and the parts are adjustable, so as to vary the amount of motion and press the fuel forward upon the grate to a larger or smaller extent, as may be necessary, according to the amount that has to be consumed for the work that is being performed. The coke, as it is formed near the supply-hopper, is agitated, broken, and moved forward every time the feed-plate *l* is operated, thereby preventing such coke obstructing the free passage of the air from below the grate-bars.

Atmosphere is also supplied to the combustion-chamber *c'* above the fuel through the flue *m*, and this flue *m* is in communication with the hollow walls and arch of the furnace, so that said atmosphere is in a highly-heated state and combines with the inflammable gases, promoting and perfecting their combustion and aiding the heat of the furnace, instead of lessening the same, as is the case where cold air is admitted above the fuel, and by using these hollow walls and arch the temperature around the furnace is lessened, and loss of heat by radiation prevented.

An opening with a damper is provided to admit air into the space between the furnace-walls, so as to supply whatever quantity of heated atmospheric air is required above the fuel to produce the most perfect combustion.

By this improvement, the fuel being fed in regularly and automatically, the combustion is not checked, neither are volumes of carbonaceous vapors evolved suddenly, and hence smoking is prevented and the consequent waste of unconsumed or uncombined carbon is avoided, the furnace requires little or no attention, and the supply of fuel can be regulated according to the work to be done. The more volatile

portions of the coal are distilled near the air-inlet, and have to travel with the fresh and highly-heated atmospheric air through the intensely-heated furnace, and in so doing the carbon will be entirely consumed and loss of fuel and heat will be prevented.

In place of using the shaft 8 driven by power, the lever *f* and grate-bars may be operated periodically by hand, and the lever *l*<sup>2</sup> can also be moved by hand, and the amount of motion may be determined by adjustable stops.

The side doors *b*<sup>3</sup> may be provided for introducing a poker or scraper for removing clinkers or cinders either above the grate *f*<sup>2</sup> or after the same has been dumped.

I am aware that furnace-bars have been made movable, so as to agitate the fuel by end movement of the bars. I am also aware that a grate has been set at an inclination and provided with stationary bars. By my improvements I provide for a progressive movement of the fuel from the highest to the lowest part of the inclined grate, and at the same time agitate the fuel and break up the coke by the rising and downward movement given to the intermediate grate-bars.

I claim as my invention—

An inclined grate composed of two sets of bars, one of which is stationary and the other is connected to bearers 4 and 5 and shaft 7 for raising the bars and moving them toward the lowest end of the grate, in combination with a hopper that supplies fuel at the upper end of the grates, substantially as and for the purposes set forth.

Signed by me this 5th day of June, A. D. 1874.

JOS. B. HOYT.

Witnesses:

GEO. T. PINCKNEY,  
CHAS. H. SMITH.