

(No Model.)

J. ABELL.

STEAM BOILER FURNACE.

No. 273,421.

Patented Mar. 6, 1883.

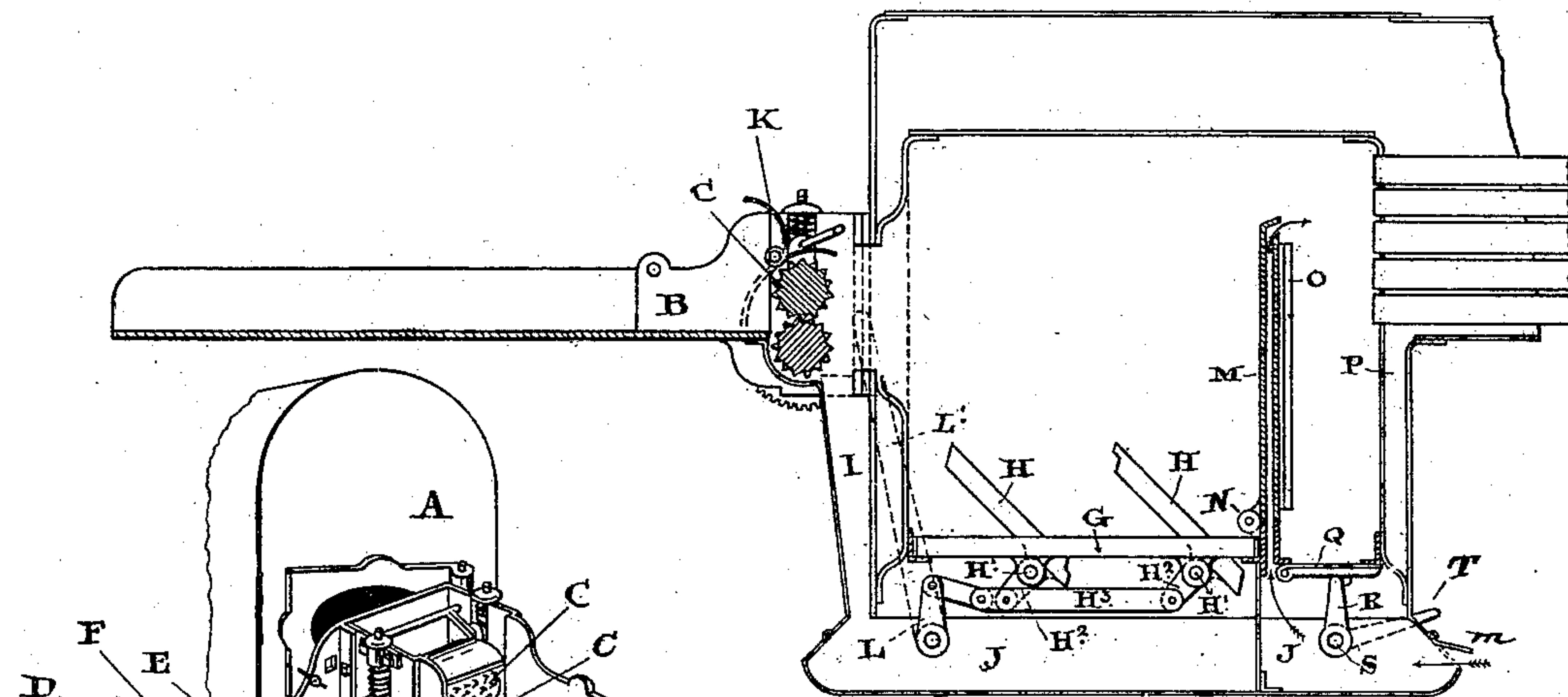


Fig. 1.

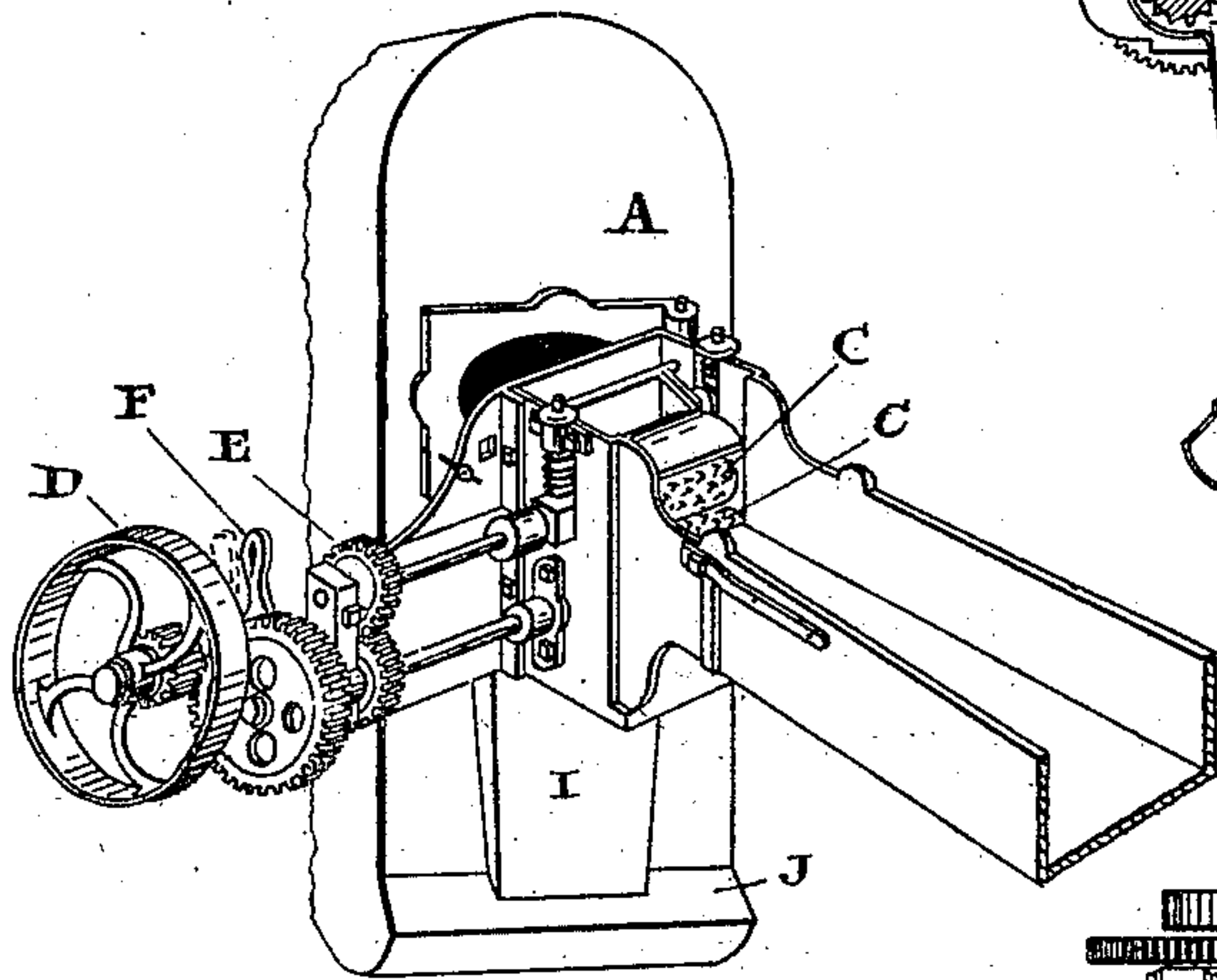


Fig. 3.

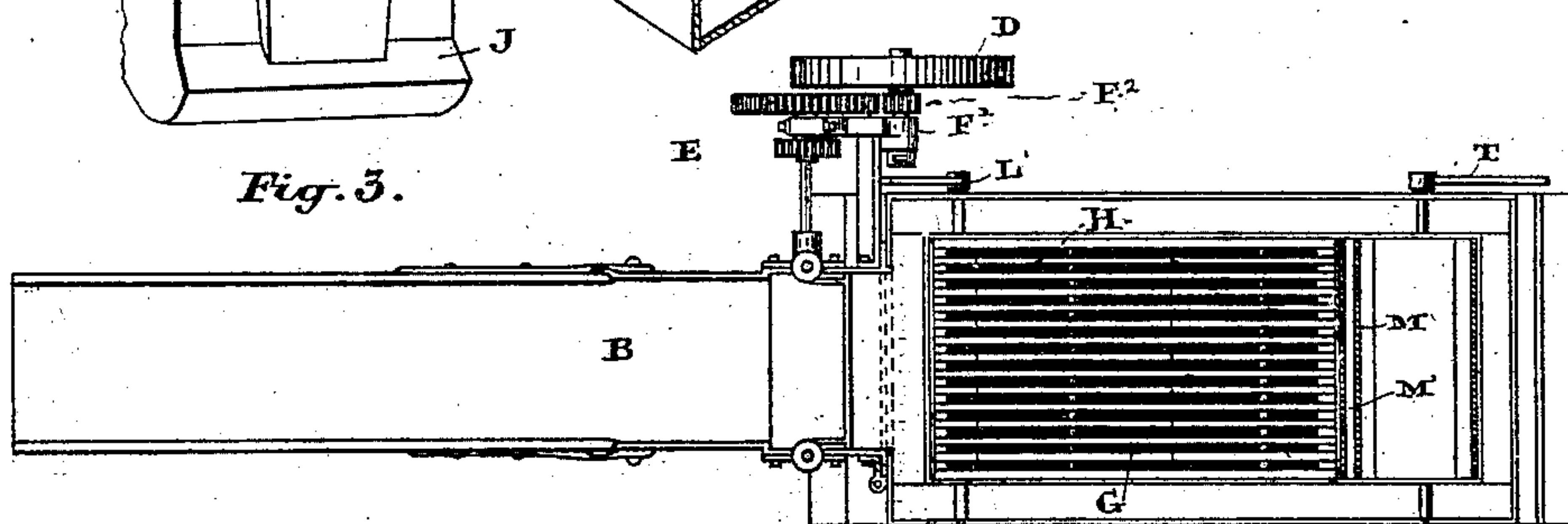


Fig. 2.

Witnesses.

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# UNITED STATES PATENT OFFICE.

JOHN ABELL, OF WOODBRIDGE, ONTARIO, CANADA.

## STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 273,421, dated March 6, 1883.

Application filed October 26, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ABELL, a subject of the Queen of Great Britain, residing at the village of Woodbridge, in the county of York, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification.

My invention relates to improvements in that class of steam-boiler furnaces in which the apparatus for feeding the fuel is attached to the furnace-door; and it consists in the peculiar construction and arrangement of parts hereinafter more fully described and claimed.

Figure 1 is a longitudinal section of a furnace provided with my straw-burning apparatus. Fig. 2 is a sectional plan of the furnace. Fig. 3 is a perspective view of the end of the fire-box or furnace, showing the straw-conveyer attached to the door of the furnace.

In the drawings, A is a furnace-door, hinged in the usual manner, and having attached to it the straw-box and its attachments, so that the door may be opened without disturbing it.

The feed-rollers C are arranged to be operated by the gearing E, which gearing is driven by the pulley D, deriving its motion from some convenient rotating part of the engine. In order that the rollers C may be readily stopped and started, I provide a handle, F, attached to a spindle upon which the pulley D revolves. The portion of the spindle upon which the pulley D revolves is eccentric with that portion of it carried in the bearing F', so that when the handle F is set at the angle shown in dotted lines the pinion F<sup>2</sup> will be carried clear of the gearing E, thereby permitting the pulley D to revolve freely. When the handle is thrown back again it is once more put into gear and the motion of the pulley transmitted to the gear. By thus manipulating the gearing the rollers C will feed on the straw contained in the box B through an aperture made for its passage in the door A into the furnace, where it falls on the grate-bars G and H. A chaff-flue, I, conveys into the ash-pan J the chaff which falls from the straw in passing through the rollers C, which chaff is drawn up by the draft into the furnace and consumed. In order to prevent the cold air entering in through the aperture in the furnace-door when the straw is not passing through it, I provide

a cover, K, which closes over the rollers when they are not employed in feeding straw. And it will be observed that this door K not only protects and covers the feed-rolls C, but that it can only move in one direction to open the draft. If it opened in the opposite direction, the draft itself would open it sufficiently to admit cold air directly into the fire-chamber; but as constructed the draft serves to close it more tightly.

As one great difficulty in straw-burning furnaces is the fact that the draft-spaces between the grate-bars become clogged by the straw falling upon them, it is necessary that means for keeping the spaces open should be provided. With that view I place between each adjacent pair of the grate-bars G two short or auxiliary bars, H, pivoted at H', and arranged so that the long end of one bar H rests upon the short arm of the bar H in the same space, thus forming, when closed, a continuous bar corresponding with the main grate-bar G.

Short arms H<sup>2</sup> extend from the pivotal point of the bars H, and are connected together by the link H<sup>3</sup>. This link is suitably connected to the crank L, which is provided with a lever, L', extending to the outside of the fire-box. By drawing up this lever L' the bars H will be thrown up in the position shown in Fig. 1, thereby by their vertical action raising the straw out of the space between the bars G, loosening the straw for the purpose of improving combustion, and at the same time clearing, as stated, the air-spaces between the bars G.

I attach importance to the bars H being pivoted to one side of their centers to form each with a long and a short arm, and to the rabbeted ends, whereby the connections between each series will not be injuriously affected by contraction and expansion, and the long arms, by their gravity, will bring the parts in place after being raised.

In order to prevent light particles of half-consumed straw entering the tubes and thereby clogging them up, I provide a device by which a current of warm air will meet the ascending particles of half-consumed straw before they enter the tubes. A hollow bridge-wall, M, is provided for that purpose. The air-space M' within this wall extends from the ash-pan J to a point within the top of the fur-



nace where it communicates with the furnace, and discharges the air admitted into its bottom from the ash-pan upon the floating particles of half-burned straw, thereby intensifying their combustion and preventing them entering the tubes.

In order that the bridge-wall shall not present an obstruction when the tubes or furnaces require repairs, I hinge it at N, thereby enabling it to be thrown back into a horizontal position, leaving a clear space in front of the tubes. This wall may be made of metal or fire-brick, and may be held in a vertical position by bolting it against an angle-iron, O, or otherwise, as found convenient.

As half-consumed fuel will find its way into the space between the bridge-wall M and flue-sheet P, I provide a hinged bottom, Q, which is held closed by the arm R, held upon or forming part of the rod S, which extends outside of the fire-box and is provided with a handle, T.

I attach importance to the pivoted arm R, for the reasons that it requires no independent fastening device to hold it in position, but locks the door securely by reason of its vertical position, and acts as a cam in its operation, and that its operating means are arranged transversely to the ash-pan. The draft admitted into the ash-pan J through the opening *m* tends to carry the finer portions or all of the half-consumed straw through the flue M' into the combustion-chamber again, where it will be consumed.

What I claim as my invention is—

1. In a furnace designed for burning straw, in which the straw is fed from a box fastened to the door of the furnace, the combination of a chaff-flue leading from below the feed-rollers to the ash-pan, substantially as and for the purpose specified.

2. In a furnace designed for burning straw, in which the straw is fed through an aperture

in the furnace-door by revolving rollers working in the straw-box, the combination, with such parts, of an adjustable cover, K, hinged to the feeding apparatus outside of the furnace to protect it and its hinges from the intense heat, and adapted to cover the feed-rolls and close the aperture in the furnace-door against the force of the draft when straw is not being fed through it, as set forth.

3. In a furnace for burning straw, the grate composed of alternate solid bars and a double series of bars in sections, each series of sections being pivoted to one side of the center, and each bar having rabbeted ends, combined with operating means, substantially as described, whereby the straw may be loosened up, the grate prevented from shaking, the bars automatically return to operative position, and the long arms of the bars of one series rest upon the short arms of the adjacent series, as set forth.

4. In a furnace for burning straw, the combination of the alternate solid bars G and sectional bars H, arranged in series and pivoted at one side of the bar-centers, having rabbeted ends, short arms H<sup>2</sup>, with link H<sup>3</sup>, and crank-levers L', pivoted at L, as and for the purposes set forth.

5. In a furnace for burning straw, in which a hollow hinged bridge-wall is placed a short distance from and in front of the tube-sheet, the combination of such wall and sheet and the ash-pan J, having aperture *m*, with the hinged bottom Q, cam-arm R, and external operating-lever, T, as shown, whereby the said arm locks the bottom in place by reason of its vertical position and its pivot S, as set forth.

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Witnesses:

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