

No. 641,497.

Patented Jan. 16, 1900.

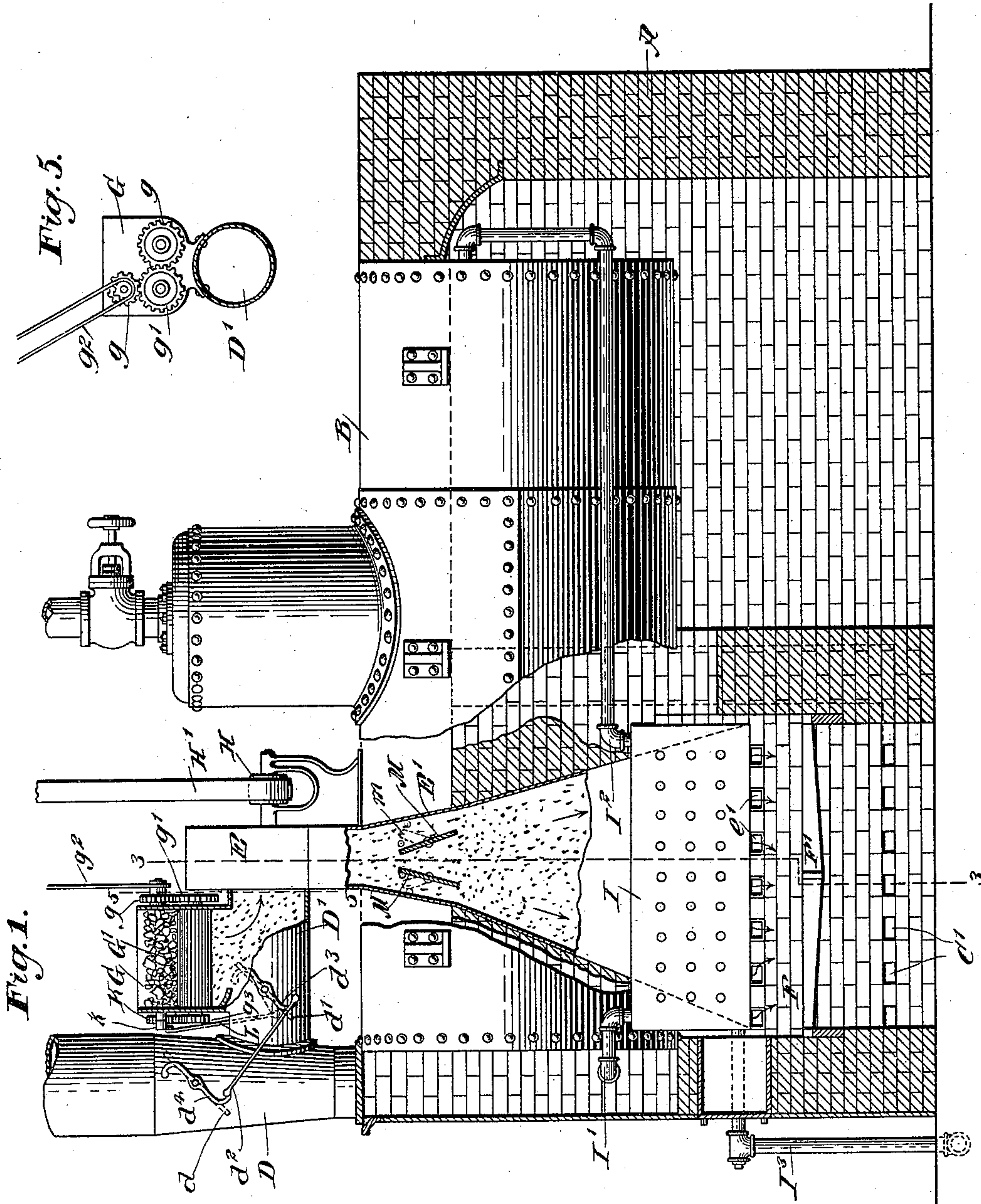
R. M. CAMPBELL & A. H. SCHOFIELD.

FURNACE FEEDING DEVICE.

(Application filed May 10, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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H. L. Reynolds.

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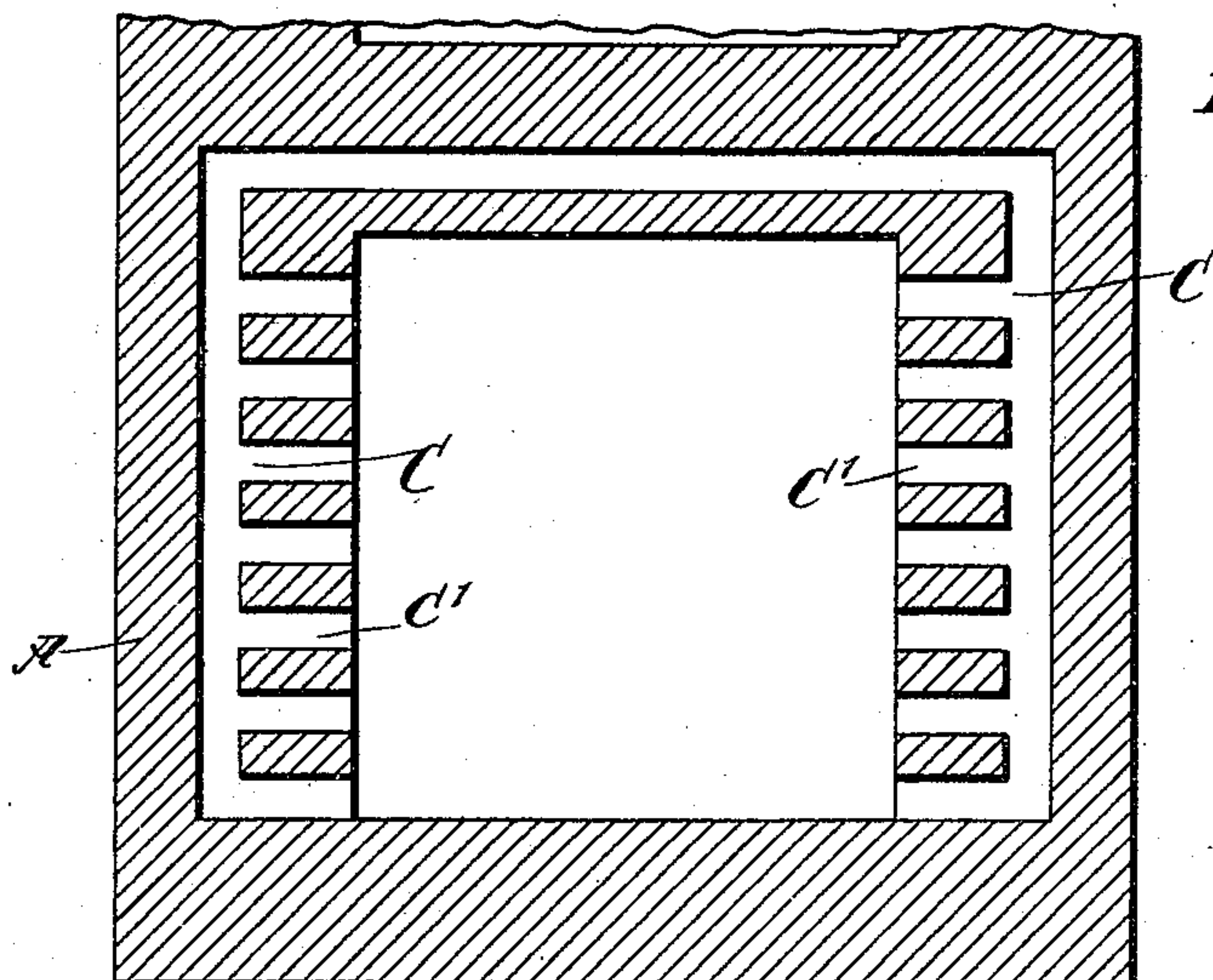


Fig. 2.

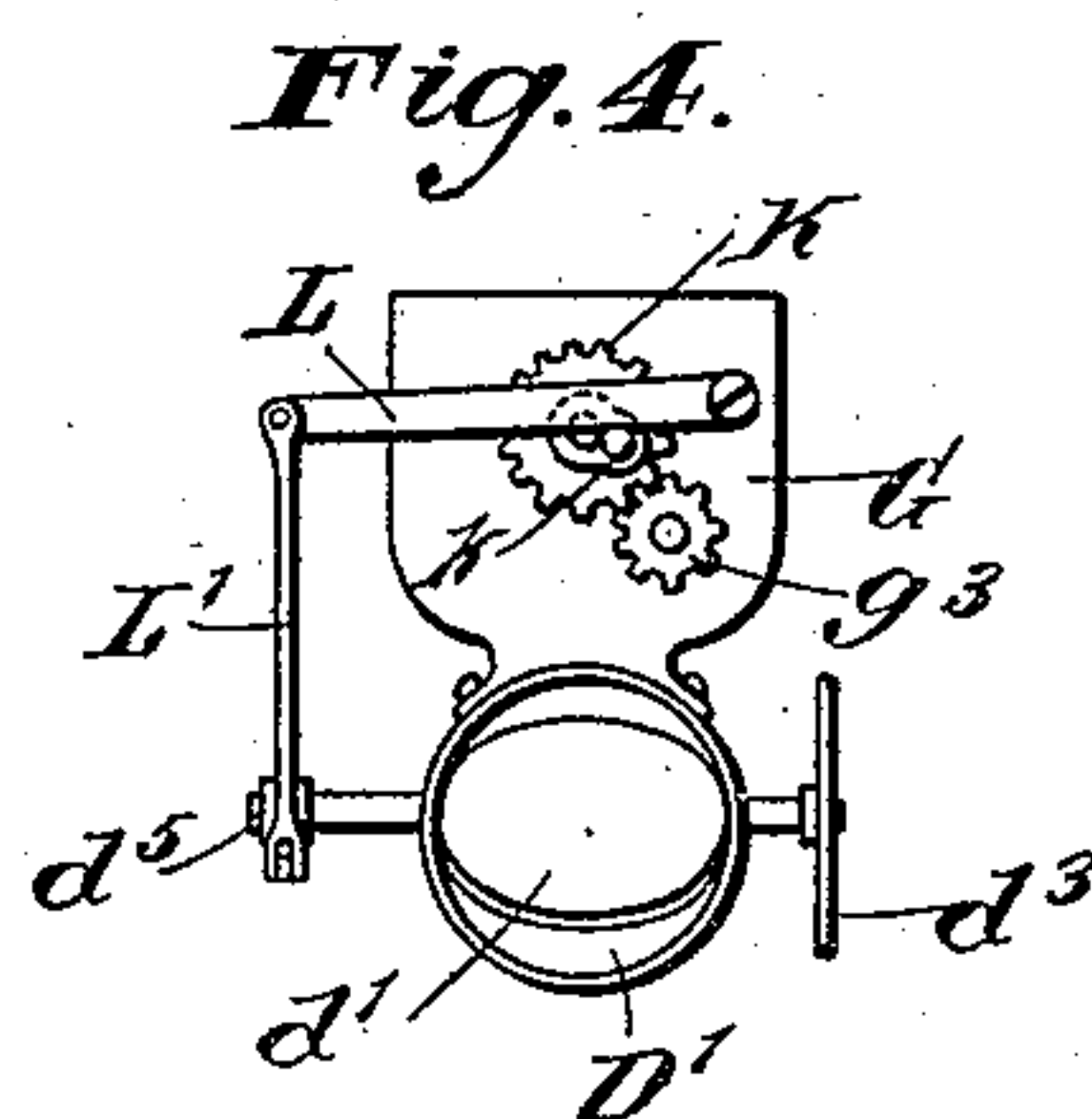


Fig. 4.

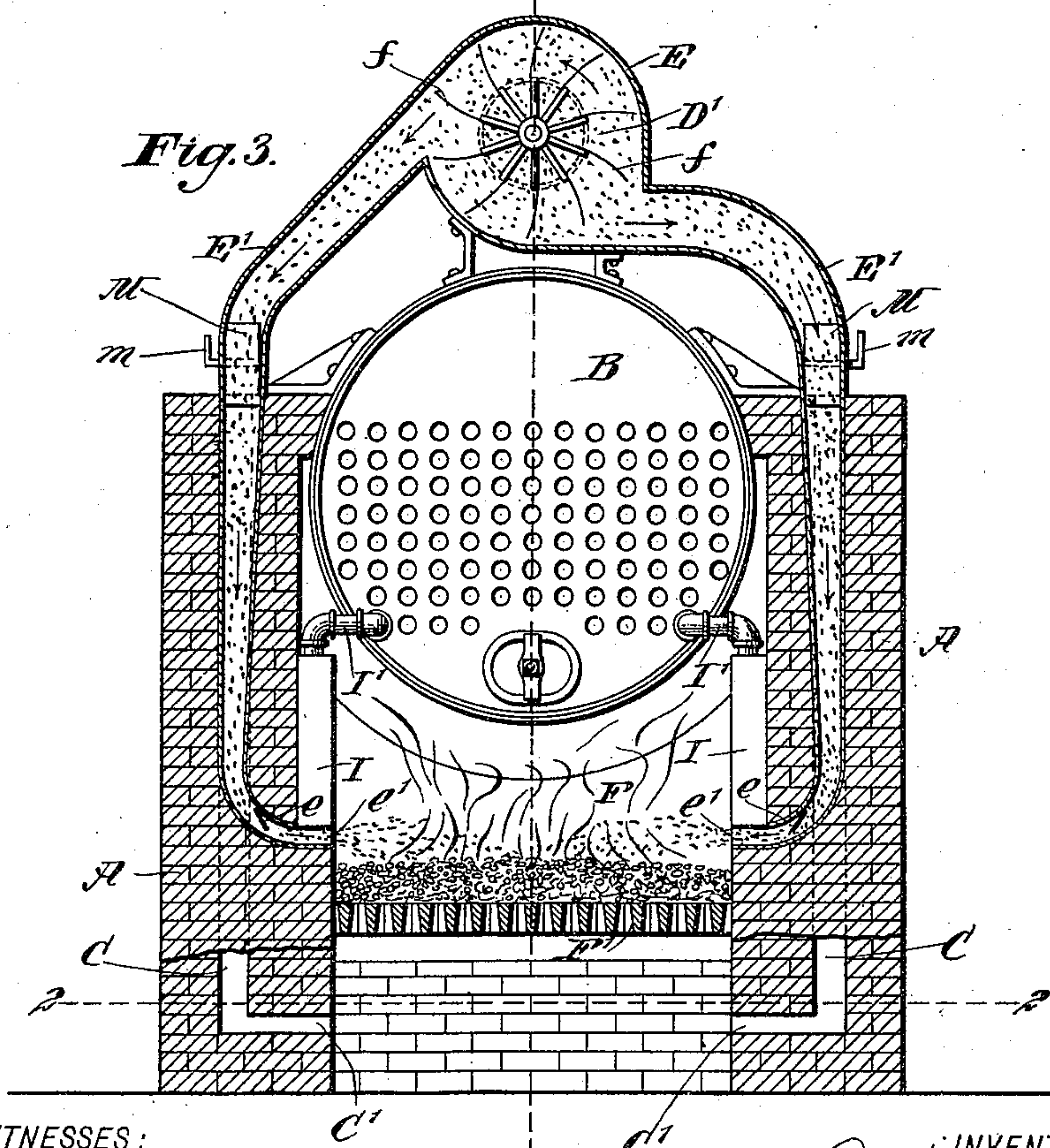


Fig. 3.

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# UNITED STATES PATENT OFFICE.

ROBERT M. CAMPBELL AND ALBERT H. SCHOFIELD, OF PORT HURON,  
MICHIGAN.

## FURNACE-FEEDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 641,497, dated January 16, 1900.

Application filed May 10, 1899. Serial No. 716,248. (No model.)

*To all whom it may concern:*

Be it known that we, ROBERT M. CAMPBELL and ALBERT H. SCHOFIELD, of Port Huron, in the county of St. Clair and State of Michigan, have invented a new and Improved Furnace-Feeding Device, of which the following is a full, clear, and exact description.

Our invention is a device for use in feeding comminuted or crushed fuel to a boiler-furnace whereby the fuel is heated by hot gases drawn from the flues which carry said gases away from the furnace.

The invention comprises the novel features of construction hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal sectional elevation of a boiler and its setting, showing our device applied thereto. Fig. 2 is a sectional plan view taken upon the line 2 2 of Fig. 3. Fig. 3 is a sectional elevation taken upon the line 3 3 of Fig. 1. Fig. 4 is an end elevation of the hopper by which the fuel is supplied, showing the mechanism for automatically and periodically operating the dampers; and Fig. 5 is a detail section taken upon the line 5 5 of Fig. 1.

Our device is intended particularly for use in connection with crushed or comminuted fuel; and its object is to secure a mechanism which shall introduce this fuel to the fire more advantageously than heretofore done and which shall also heat the fuel before introduction to the fire by mixing it with hot gases drawn from the uptake or discharge flues leading from the boiler, which besides heating the fuel before introduction insures that the gases shall be perfectly consumed instead of being discharged imperfectly consumed into the chimney. The boiler B may in its principal points of construction be similar to any ordinary boiler and is set in the usual masonry A.

We have herein shown in connection with the boiler heaters I, located one at each side of the furnace beneath the boiler and shaped as a comparatively thin box, which is connected at each end of its upper side, by means of pipes I' and I<sup>2</sup>, respectively, with the front

and rear end of the boiler. The water-supply for the boiler is passed through these heaters, being introduced through the pipes I<sup>3</sup>, which enter the heaters at their lower edge. The grate F' is located a short distance beneath the heaters and beneath the openings e', through which the fuel is introduced to the furnace. These fuel-feeding openings are placed immediately beneath the lower edge of the heaters I.

Fresh air for combustion purposes is passed through flues C, constructed in the boiler-setting, whereby the air is heated and is conducted from said flues to draft-openings C', communicating with the space beneath the grate F'. These flues may be provided with dampers, by which the admission of air may be regulated. The gases after leaving the boiler pass upward into a smoke-stack D, which is provided with a damper d, by means of which the flow of gases in the stack may be controlled. An arm d<sup>4</sup> is secured to the axis of this damper outside the stack, by means of which arm the damper may be adjusted, as hereinafter described.

The fuel is introduced by any convenient means to a hopper G, which is herein shown located, as a matter of convenience, above the boiler and close to the stack. This hopper is provided with two or more rollers G', located in its lower portion and provided on their shafts at one end of the hopper with gear-wheels g', meshing with each other, so that the rollers will turn together. Power is applied to these rollers through a gear-wheel g, which is placed upon a shaft having a sprocket-wheel, over which passes a belt or sprocket-chain g<sup>2</sup>. The manner of applying power to the rollers may vary according to the circumstances. The rollers and the hopper are placed immediately above a pipe D', which is connected at one end with the smoke-stack D and is provided also with a damper d', by which the said pipe may be closed, thus preventing withdrawal of gases from the smoke-stack into said pipe. This damper is provided with an external crank-arm d<sup>3</sup>, which is connected, by means of a link d<sup>2</sup>, with the arm d<sup>4</sup> upon the damper d in the smoke-stack. It is evident that these two dampers may be connected with each other directly by a link



which lies within the smoke-stack and the pipe D'. The pipe D' is connected with the discharge from the rollers G', so that the fuel which passes between the rollers is discharged  
5 into said pipe. The rollers are set so as to crush the fuel uniformly to whatever size is desired. This size is preferably quite small, so that the fuel may be carried by an air-blast to the furnace and deposited upon the fire.

10 At the end of the pipe D' opposite its connection with the smoke-stack is placed a casing E, within which is a fan f, which is rotated by means of an external pulley H, secured to its shaft and upon which a belt H'  
15 is placed, said belt leading to any source of power. This fan-casing has two discharges connecting with pipes or flues E', which lead outwardly and then down upon opposite sides of the boiler through flues constructed in the  
20 boiler-setting. Each flue as it descends near to the grate is widened, so as to be substantially of a width equal to the depth of the furnace, and each flue communicates with the furnace by means of the openings e, which  
25 are comparatively small and through which the fuel is discharged into the furnace. Each flue may be provided, if desired, with a damper e, by means of which its connection with the furnace may be controlled, such dampers  
30 being automatic, opening inward by the pressure of the draft and closing when the draft ceases.

Upon one end of the hopper G—the end next to the stack—as herein shown, is placed a  
35 device for automatically controlling the dampers d and d'. This device consists of a pinion g<sup>3</sup>, which is secured to the end of one of the rollers G', and a gear-wheel K, which is journaled upon the end of the hopper and  
40 meshes with the pinion g<sup>3</sup>. The gear-wheel K has a crank-pin k projecting therefrom and engaging a lever L, said lever being pivoted at one end to the hopper G and being connected at its other end by means of a link L'  
45 with a crank-arm d<sup>5</sup>, secured upon the shaft of the damper d', by which mechanism the dampers d and d' are alternately opened and closed, so that the draft passes at one time  
50 straight up the stack or chimney D, and at another time the damper d closes the chimney-opening, and the draft then passes into the pipe D', owing to the suction of the fan f. This draft carries with it the finely-commi-  
55 nuted fuel and conveys said fuel through the flues E' into the furnace. It will be noticed that the dampers d and d' are so placed that when one is open the other is closed.

To more thoroughly control and distribute the fuel, deflector-plates M are placed in the  
60 upper part of the flues E' and may be adjusted to any position by means of outside handles m, so as to throw the fuel toward either the front or rear.

The mechanism described results in peri-  
65 odically drawing hot gases from the flues, leading the gases away from the boiler, and discharging them back into the furnace, car-

rying with them the finely-comminuted fuel, which is heated thereby before being introduced into the furnace. When the damper  
70 d' is closed, the gases pass directly up the chimney, and there being no draft through the pipe D' there is no feeding of fuel to the furnace. This condition will, however, last  
75 but a comparatively small portion of the time, as there will be more or less draft past the damper d', excepting for the short time when it is completely closed. The result of this  
80 manner of feeding the furnace is that the gases are completely burned and the maximum combustion efficiency of the fuel is secured, due in part to its heating before being  
85 introduced into the furnace. The fuel being finely divided before being introduced into the furnace is quickly and thoroughly consumed. It is also possible by this means to use fuel of greatly inferior quality than where  
90 fuel is used in the ordinary manner by shoveling upon the grate.

Having thus fully described our invention,  
90 we claim as new and desire to secure by Letters Patent—

1. A furnace-feeding mechanism, comprising a fan having suction connection with the  
95 flue carrying the exhaust-gases from the furnace, a fuel-supply discharging into the said connection, dampers in the flue leading from the furnace and in the connection from said  
100 flue to the fan, connections between said dampers, whereby they are held in opposite positions, and means for automatically and periodically shifting the dampers, substantially as described.

2. A furnace-feeding mechanism, comprising a fan having suction connection with the  
105 flue carrying the exhaust-gases from the furnace, a fuel crushing and feeding device discharging into said connection, dampers in the flues leading from the furnace and in the connection from said flue to the fan, connections  
110 between said dampers, whereby they are held in opposite positions, means for automatically and periodically shifting the dampers, and a flue leading from the fan-discharge to the furnace and discharging therein above the  
115 grates, substantially as described.

3. A furnace-feeding mechanism, comprising a fan having suction connection with the  
120 flue carrying the exhaust-gases from the furnace, fuel-crushing rolls and means for turning them, connections between the discharge from said rolls and the fan-suction, flues leading from the fan-discharge to the flues above the  
125 grates, dampers in the flue leading from the furnace and in the connection from said flue to the fan, connections between said dampers, holding them in opposite position, a crank geared to turn with one of the rolls,  
130 a lever vibrated by engaging with said crank, and connections from said lever to the dampers, whereby they are periodically opened and shut, substantially as described.

4. A furnace-feeding device for use with a  
comminuted fuel, comprising a draft connec-



tion or flue leading from the flue carrying the exhaust-gases from the furnace back to the furnace above the grate, a fuel-feeding mechanism discharging into said draft connection, 5 adjustable deflecting or guide plates in the flue between the point of receiving the fuel and the furnace, a draft-forcing mechanism connected with said draft connection, substantially as described.

10 5. A furnace-feeding device for use with comminuted fuel, comprising a forcing mechanism for hot gas, a fuel-feed discharging into the hot-gas supply, a flue for conducting the

hot gas and fuel to the furnace, said flue expanding in one direction to substantially the 15 width of the furnace and discharging into the furnace through numerous openings in the walls and adjustable guide or deflector plates within said flue and between the fuel-feed and the furnace, substantially as described.

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Witnesses:

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