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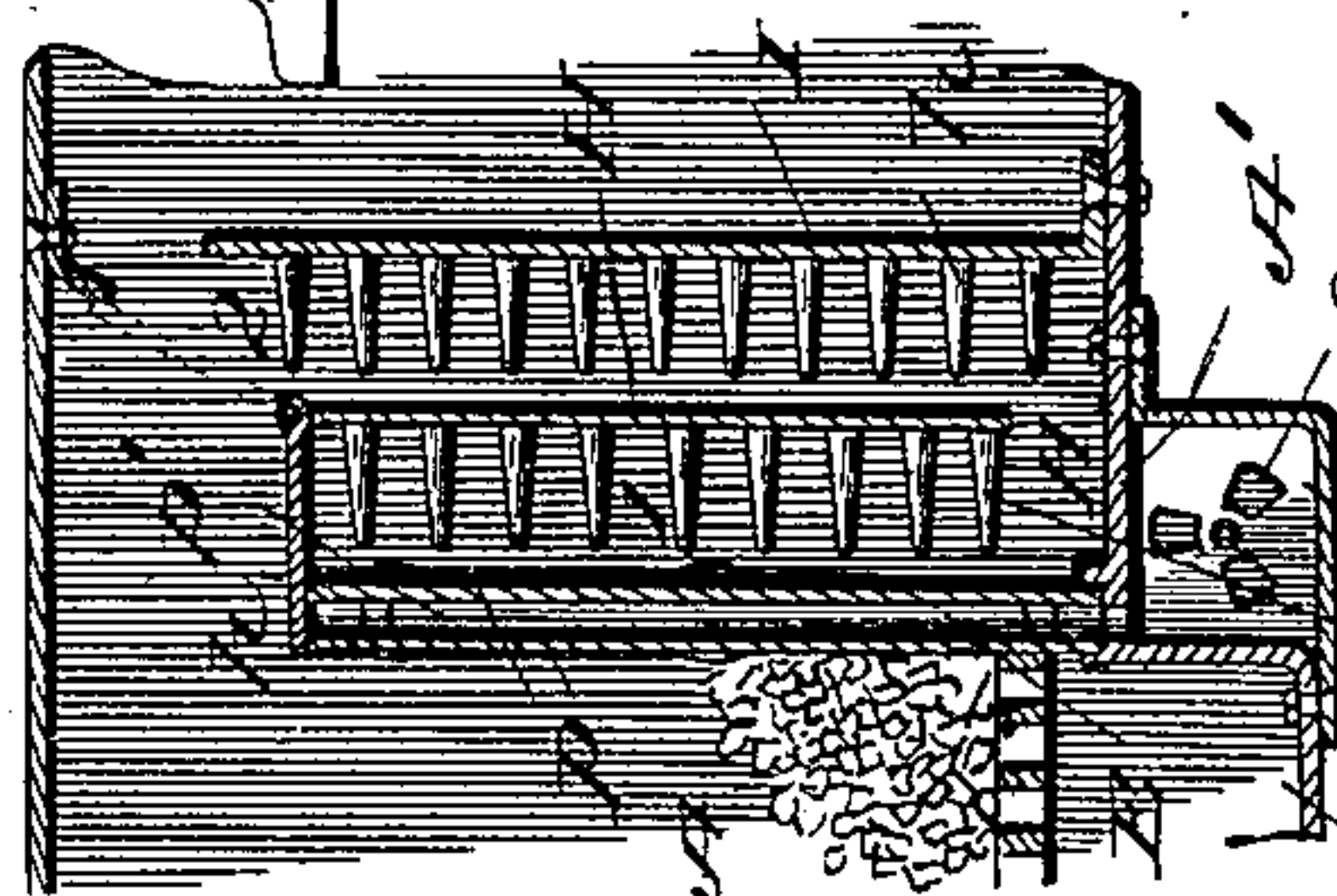
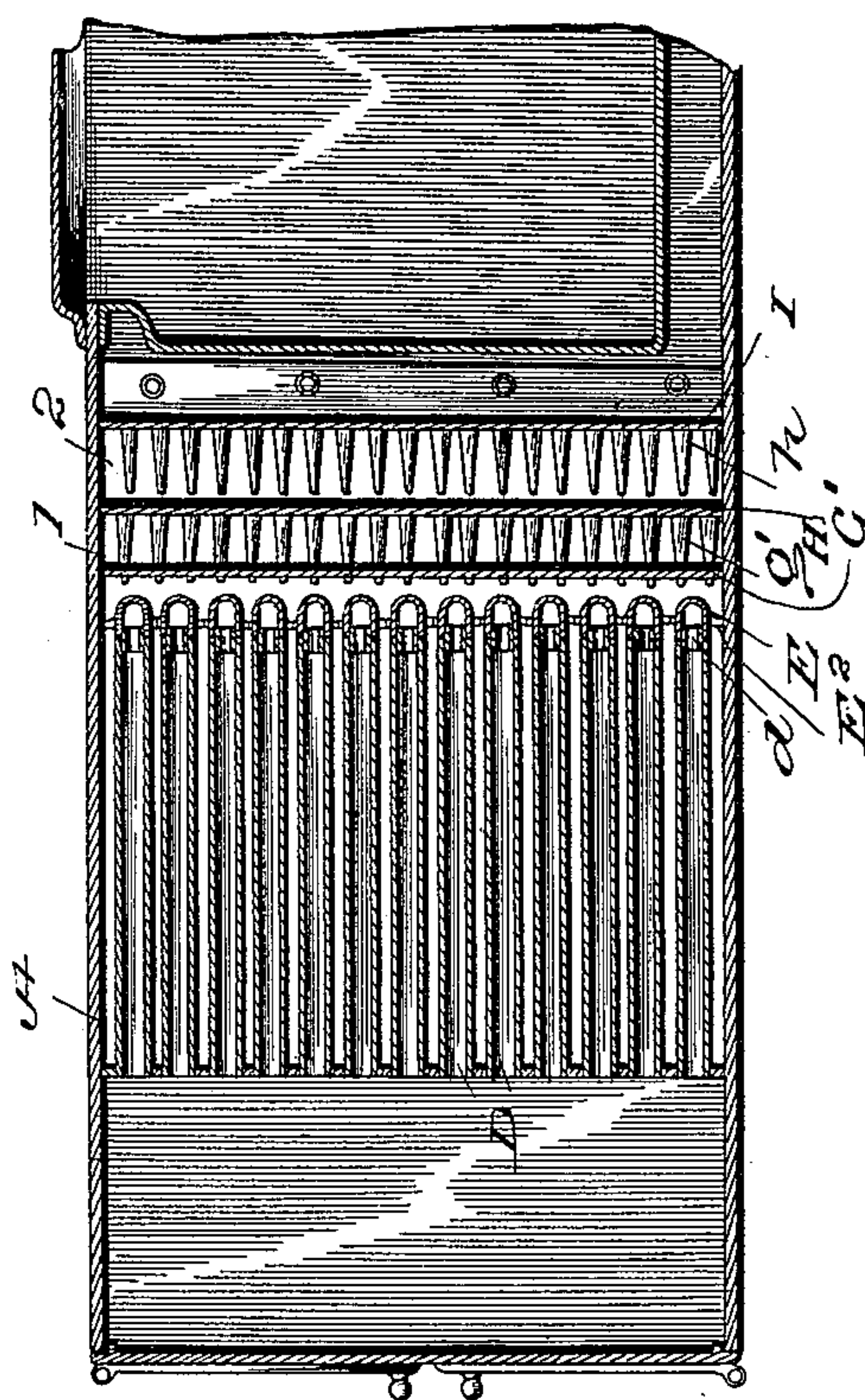
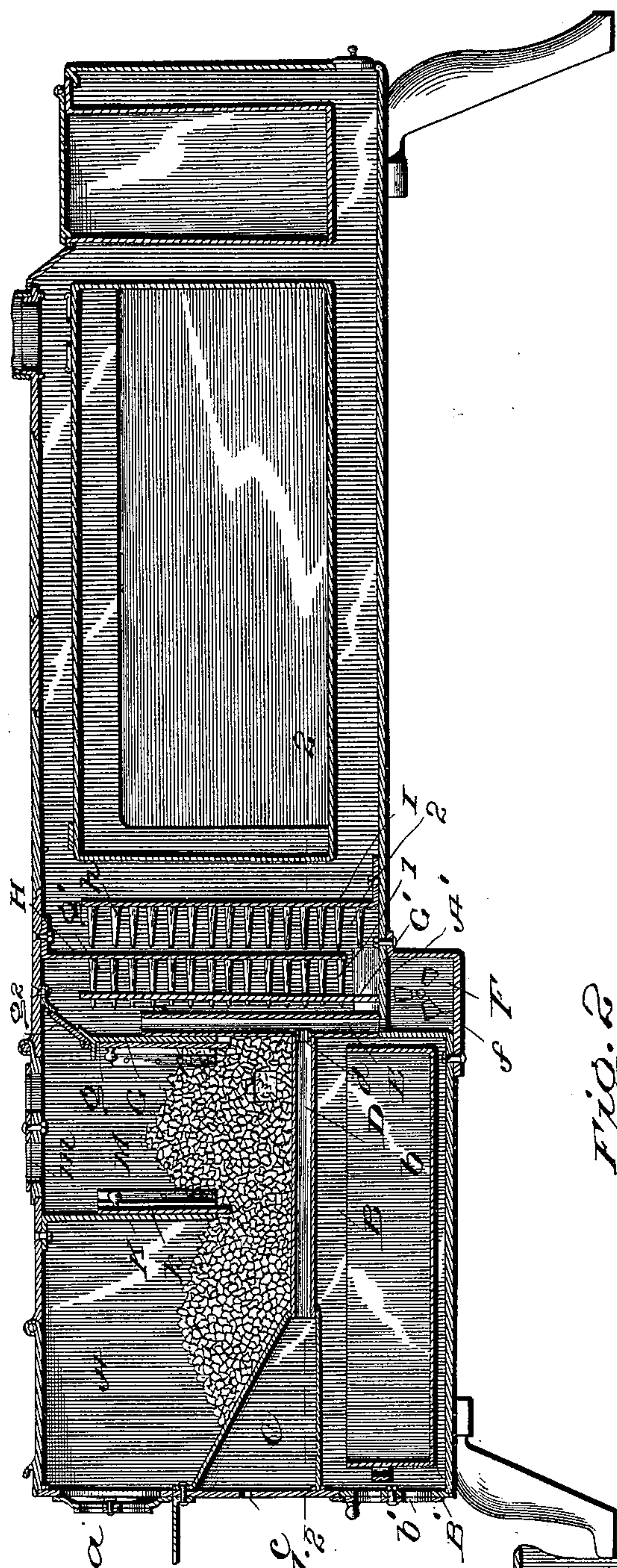
Patented Nov. 7, 1899.

**V. W. BLANCHARD.**  
**COOKING STOVE.**

(Application filed Apr. 30, 1898. Renewed Aug. 21, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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James R. Mansfield.

Inventor  
Virgil W. Blanchard.  
By Alexander  
+ Sewell  
Attorneys



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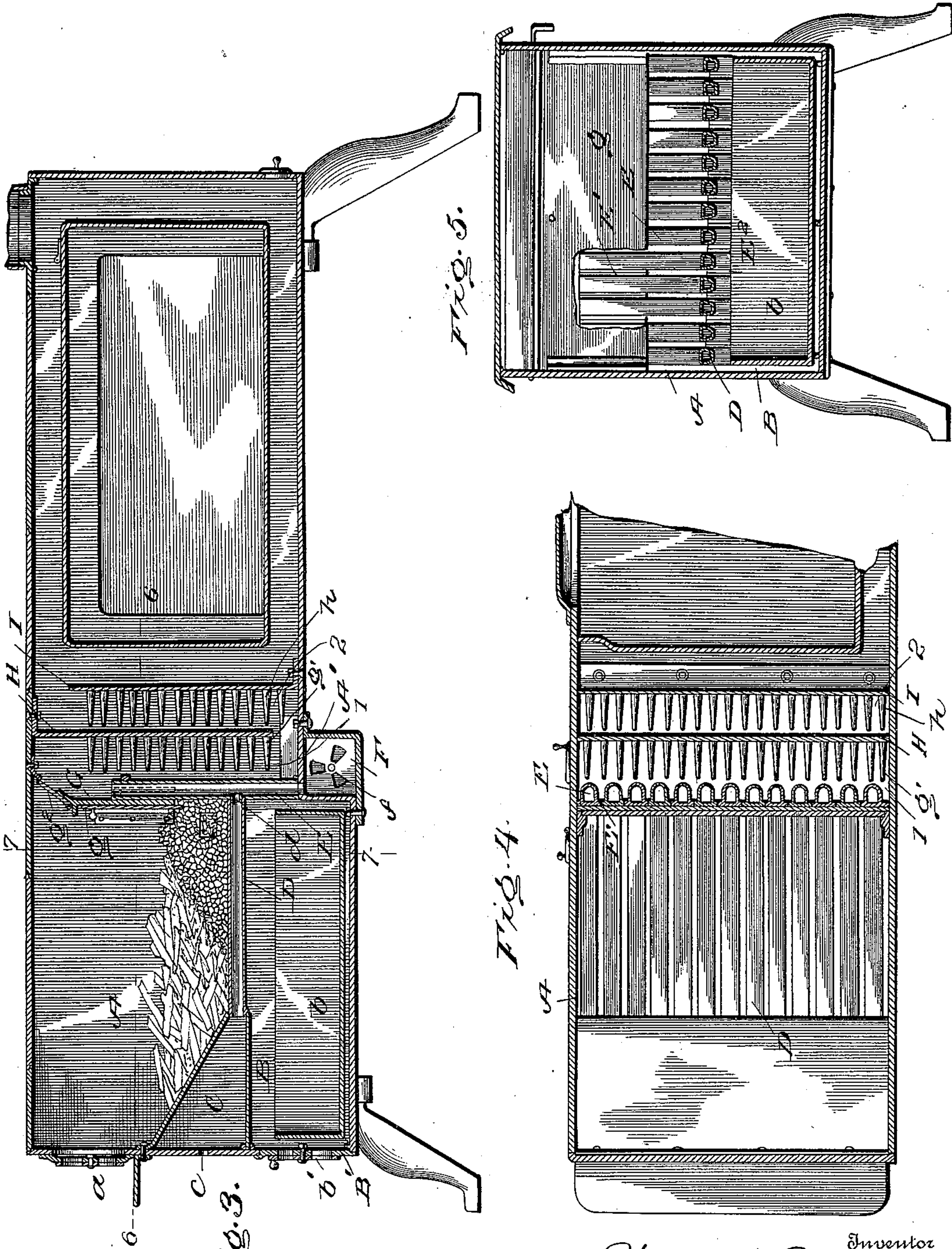
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Witnesses

*James R. Mansfield*

By:

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Inventor

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# UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y.

## COOKING-STOVE.

SPECIFICATION forming part of Letters Patent No. 636,711, dated November 7, 1899.

Application filed April 30, 1898. Renewed August 21, 1899. Serial No. 727,980. (No model.)

*To all whom it may concern:*

Be it known that I, VIRGIL W. BLANCHARD, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Cooking-Stoves; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in cooking-stoves; and its object is to economize fuel by so constructing the stove that substantially all the gases evolved during the process of combustion of the fuel will be consumed in secondary combustion-chambers in the stove instead of being permitted to escape into the chimney and wasted, as is the case in the ordinary stoves now generally used.

While my invention is shown as embodied in a cooking-stove, it can also be utilized in heating-stoves and furnaces by omitting the ovens and water-drums and properly designing the parts; but the invention is particularly useful for cooking-stoves in that it can produce and maintain high and substantially uniform temperatures very quickly.

The invention therefore consists in the novel construction and combination of parts hereinafter described and claimed, and the accompanying drawings illustrate cooking-stoves embodying the invention.

Figure 1 represents a longitudinal vertical section through a self-feeding or fuel-reservoir stove. Fig. 2 is a horizontal section of the same on line 2 2, Fig. 1. Fig. 3 is a longitudinal section through a modified form of stove. Fig. 4 is a horizontal section on line 6 6, Fig. 3. Fig. 5 is a transverse section on line 7 7, Fig. 3, showing the construction of the grate and fireback. Fig. 6 is a detail section of another modification.

The body of the stove is of ordinary appearance, having a front fire-chamber A, below which is an ash-pit B, in which is an ash-pan b, the front of the pit being closed by a door B', provided with an air-inlet valve b'. The fire-chamber also has a valved air-inlet a. The ash-pit and fire-chamber are separated by an air-heating chamber C and the grate, which, as shown in Figs. 1 to 5, is composed of a series of horizontally-disposed hollow

bars D. The top of air-chamber C is preferably inclined downwardly, as shown, so as to direct coal onto the horizontal grate-bars D. Air may be admitted to chamber C through a valve-opening c in the front wall of the stove. The grate-bars D open at front into chamber C and at rear communicate with vertical hollow bars E, forming the fireback.

In front of the fireback and above the grate is a transverse plate G, which extends to near the top of the stove, and on the upper end of this partition is a valve g<sup>2</sup>, which when opened allows the escape of the gases above the fuel. In front of the plate G is a vertically-adjustable slide g, which may be adjusted up or down, for the purpose to be hereinafter explained.

In rear of the fireback and connected to the top of the stove is a vertical partition H, and in rear thereof and connected to the bottom of the stove is a vertical partition I. Between partition H and the tubes E is a vertical deflector G', by which the gases escaping from the fuel-chamber are caused to flow upward to the top of flue 1 and then descend therein. The partitions H and I are separated, so as to form ascending and descending flues 1 and 2, respectively, the latter communicating with the ordinary outlet-flues of the stove. These partitions are each thickly studded on their forward faces, as shown at g h, respectively, the object of these studs being to insure a thorough commingling of the gases and air passing through said flues.

In Fig. 1 there is a transverse partition K in front of partition G, provided with an adjustable slide k. The space between the plates K J forms a coal-reservoir M, the depth of which can be regulated by the vertical adjustment of plates K J. An air-inlet valve m may be arranged in the top of the stove over the reservoir M.

The stove shown in Fig. 3 is in all substantial respects the same as that shown in Fig. 1 so far as the present invention is concerned, except that the plate K and adjustable valve k are omitted. In this case also the deflector G' is omitted, as I do not consider it always essential.

A simpler form of stove is shown in Fig. 6. In this case an ordinary grate is employed,



and the fireback consists of two thin metal plates  $p$ , the air-space  $p'$  between which communicates at bottom with the air-chamber F. The partition H in this case is provided at top with a valve  $h$ , which when lowered closes flue 1 and allows direct communication between the fire-chamber and the oven-flues; but when raised to the position shown in dotted lines in Fig. 6 the products of combustion are directed downward through flue 1 and upward through flue 2, as before described. In this construction the hot air is supplied to the products of combustion entering chamber 1 and producing combustion of the gaseous products as they pass through the flues 1 and 2, substantially as in the stove shown in Figs. 1 and 3 and as hereinafter described.

As shown in Figs. 3 and 4, the bars D and E are each formed of opposite semitubular valves bolted together.

I do not claim herein the hollow plate *per se*, reserving same as subject-matter for another application.

Operation: A fire is kindled upon the grate while the valve  $a$  is closed and valve  $b$  is open, the damper  $g^2$  being adjusted so as to allow a direct upward draft through the grate and fuel thereon. After a good bed of coals is formed the valve  $b$  and damper are shut and valves  $c$  and  $a$  are opened, and no air is then admitted to the ash-pit, in Figs. 1 and 3. The products of combustion will not descend through the grate, Figs. 1 and 3; but instead the draft will now be direct from the valve into and through the bed of coals in a horizontal direction and out between the tubes E above the grate, but below the plate  $g$  and the surface of the fuel, and this horizontal traverse of the currents through the bed of fuel in the grate is of great importance, as the fuel-gases generated in the fire-chamber are heated to the highest degree and the smoke and volatile hydrocarbons ordinarily given off from a fresh supply of fuel will be compelled to pass through the incandescent fuel on the grate, heating it and the fireback E, and then escape into the passage between the fireback and the deflector  $G'$ , and rising beside the fireback the air is intimately mixed with the air escaping at the upper end of bars E, which said air is highly heated by its passage through the chamber C, bars D, and bars E. If desired, air can also be admitted into bars E from the chamber F by opening valve  $f$ . The mixing air and gases are then caused to descend in flue 1 and ascend in flue 2 and in so doing are broken up and commingled by their contact with the numerous studs in said chambers, this commingling insuring the combustion of all the oxidizable elements in the fuel.

By making the grate-bars and fireback hollow and allowing the current of air to constantly traverse them they are kept at sufficiently low temperature to insure their stability.

By adjusting the plate  $g$ , the lower portion of which may be formed of fire-brick, the

depth of the bed of incandescent fuel upon the grate can be regulated as desired so that either a deep or shallow fire can be maintained in the fuel-chamber. As the bars E are exposed to heat on all sides, the air passing therethrough will be highly heated and rendered most efficient in producing combustion of the gases when subsequently mixed therewith.

By the employment of the fuel-magazine shown in Fig. 1 the fire can be maintained for a great length of time without attention, and by shutting the anterior gate  $k$  after the fire is kindled the combustion may be confined entirely to the compartment M, thereby lessening the volume of fuel undergoing the process of combustion at any time. In such case the valve  $m$  should be opened to supply the air necessary to support the combustion. By adjusting both gates  $k$   $g$  equally the depth of burning fuel in the compartment M may be regulated.

It will be observed that in the construction shown in Figs. 1 to 5 the products of combustion pass down through the fuel and then horizontally rearward over the grate to escape. I do not, however, consider my invention confined entirely to this horizontal traverse of the gases, as very valuable results are obtained by constructing the stove with ascending and descending mixing-flues and with means for introducing heated air into the products of combustion before or during their entry into the ascending or descending flues or mixing-chambers 1 and 2. The number of mixing-flues may be varied, though the number shown and described is productive of very beneficial results.

The operation of the stove shown in Figs. 3 and 4 is substantially the same as that shown in Figs. 1 and 2, already described. In this case, however, the deflector-plate  $G'$  is not used and the products of combustion issue direct from the fire-chamber into the descending flue 1, wherein they are mingled with the air entering the descending flue 1 through the hollow bars E or back with substantially the same result as above described.

In Fig. 6 after the fire is started the valve  $e'$  is raised to the position shown in full lines. Then the products of combustion pass over the fireback and descend through flue 1, in so doing being mingled with the heated air rising through the hollow fireback  $p$ , the products of combustion being consumed with the hot air in passing through the flues 1 and 2. In this latter modification the ordinary upward draft through the fuel is employed.

I do not wish to limit myself to the particular construction and arrangements of parts herein shown and described; but

What I do claim is—

1. In a stove, the combination of the ash-pit, the fire-chamber, the vertical air-passages at the rear end of the grate, and the hollow grate-bars connecting with said vertical passage, and secondary combustion-chambers



communicating with said fire-chamber and passage, for the purpose and substantially as described.

2. In a stove, the combination of the fire-chamber, the air-heating fireback, and the outlet for the products of combustion, the parallel ascending and descending flues in rear of the fireback forming a secondary combustion-chamber through which products of combustion are caused to pass after they escape from the fire-chamber, substantially as described.

3. In a stove, the combination of the ash-pit, the fire-chamber, the interposed air-heating chamber, the vertical air-passages at the rear end of the grate, and the hollow grate-bars connecting the air-chamber with said passages, and secondary combustion air and gas mixing chambers communicating with fire-chamber and said passages for the purpose and substantially as described.

4. In a stove, the combination of a fire-chamber, the series of vertical bars at the discharge end thereof, through which the products of combustion are caused to pass in a lateral direction above the surface of the grate, but below the surface of the fuel, and an adjustable plate for regulating the depth of the smoke-passage, substantially as described.

5. In a stove, the combination of a fire-chamber, the series of vertical hollow bars at the discharge end thereof, through which the products of combustion are caused to pass in a lateral direction above the surface of the grate, but below the surface of the fuel, and an adjustable plate for regulating the depth of the smoke-passage; with the ascending and descending flues or gas and air mixing chambers, and means for admitting air to said bars, substantially as described.

6. In a stove the combination of the ash-pit, fire-chamber, the hollow grate-bars, the vertical hollow fireback; with which said hollow grate-bars communicate, and a series of mixing-chambers in which the products of combustion and heated air are commingled, substantially as described.

7. In a stove, the combination of the fire-chamber, the air-heating chamber and the hollow grate-bars interposed between the fire-chamber and ash-pit, and a series of hollow bars forming the fireback of the fire-chamber and communicating with the hollow grate-bars and an adjustable plate for regulating the depth of the burning fuel, substantially as described.

8. In a stove, the combination of the fire-chamber, the air-heating chamber thereunder, and a hollow air-heating fireback communicating with the air-heating chamber and an adjustable plate for regulating the depth of the burning fuel; with descending and ascending mixing chambers or flues into which the products of combustion and hot air are

discharged, for the purpose and substantially as described.

9. In a stove, the combination of the fire-chamber, the air-heating chamber thereunder and the hollow grate-bars interposed between the fire-chamber and ash-pit, and a series of vertical hollow bars forming the fireback communicating with the hollow grate-bars, and an adjustable plate for regulating the depth of the burning fuel; with descending and ascending mixing chambers or flues into which the products of combustion and hot air are discharged, and means for admitting cool air into the lower ends of said tubes, for the purpose and substantially as described.

10. In a stove, the combination of the ash-pit and fire-chamber, a hollow air-heating fireback, and means for admitting air into the bottom of said fireback; with the secondary combustion-chamber in rear of the fireback, substantially as and for the purpose described.

11. In a stove, the combination of the ash-pit and fire-chamber, a hollow air-heating fireback, and means for admitting air into the bottom of said fireback; with the parallel ascending and descending flues beside and in rear of the fireback provided with a series of studs to cause the thorough commingling of the air and gases passing through said flues, substantially as and for the purpose described.

12. The herein-described stove consisting of the fire-chamber, ash-pit, air-heating chamber interposed between the fire-chamber and ash-pit, the vertical hollow firebacks, the hollow grate-bars connecting the air-chamber with said fireback, the partition K and adjustable plate *k* forming an adjustable fuel-reservoir in the stove and the mixing-chambers 1 and 2 into which the products of combustion and heated air are passed, for the purpose and substantially as described.

13. The herein-described stove consisting of the fire-chamber, ash-pit, air-heating chamber interposed between the fire-chamber and ash-pit, the vertical hollow bars forming the fireback, the hollow grate-bars connecting the air-chamber with said vertical bars, the deflector G' in rear of said fire-back and adjustable plate J for regulating the depth of burning fuel on the grate and the flues 1 and 2 into which the products of combustion and heated air are passed, for the purpose and substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VIRGIL W. BLANCHARD.

In presence of—

JAMES R. MANSFIELD,  
B. T. WEBSTER.