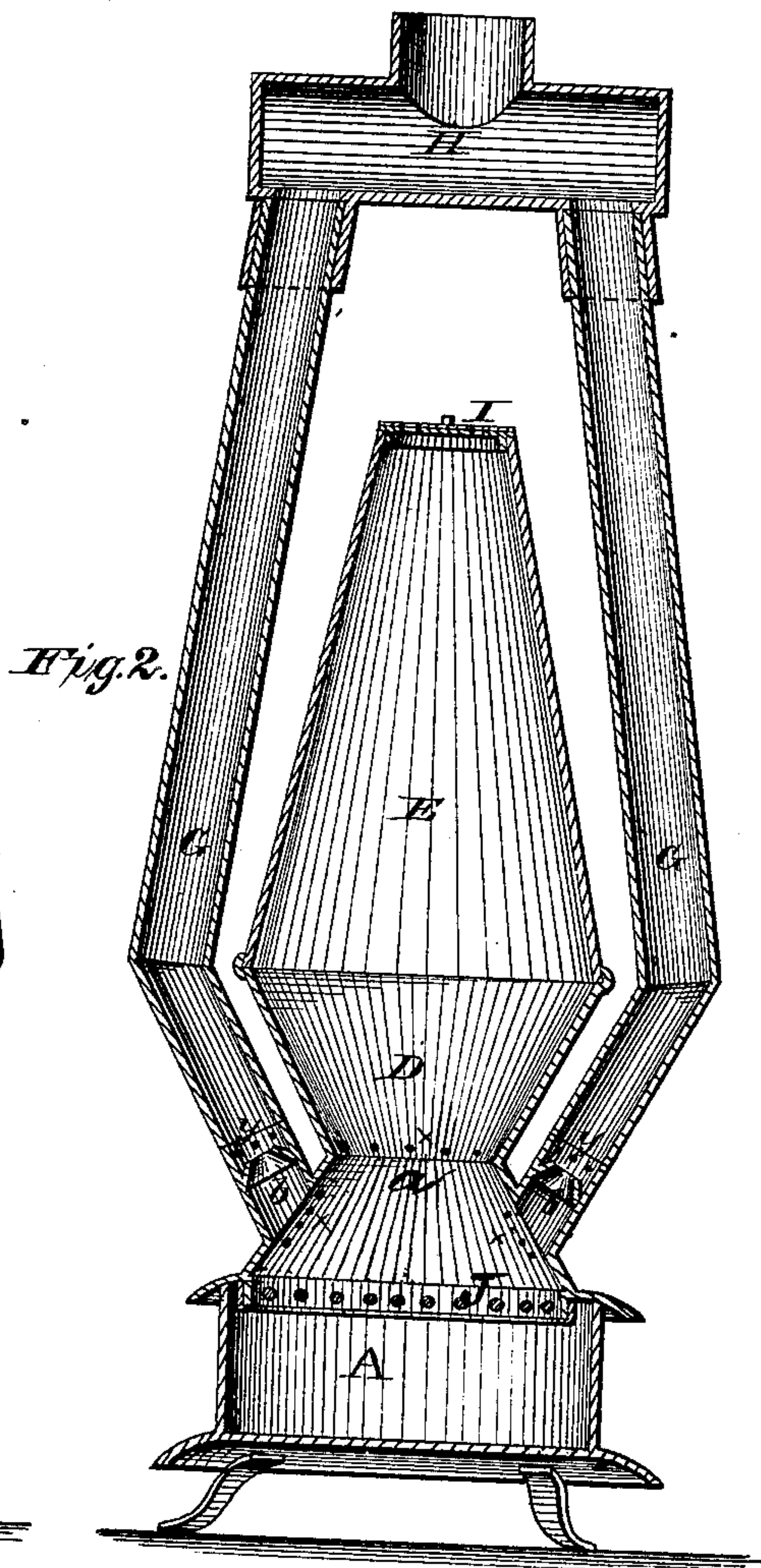
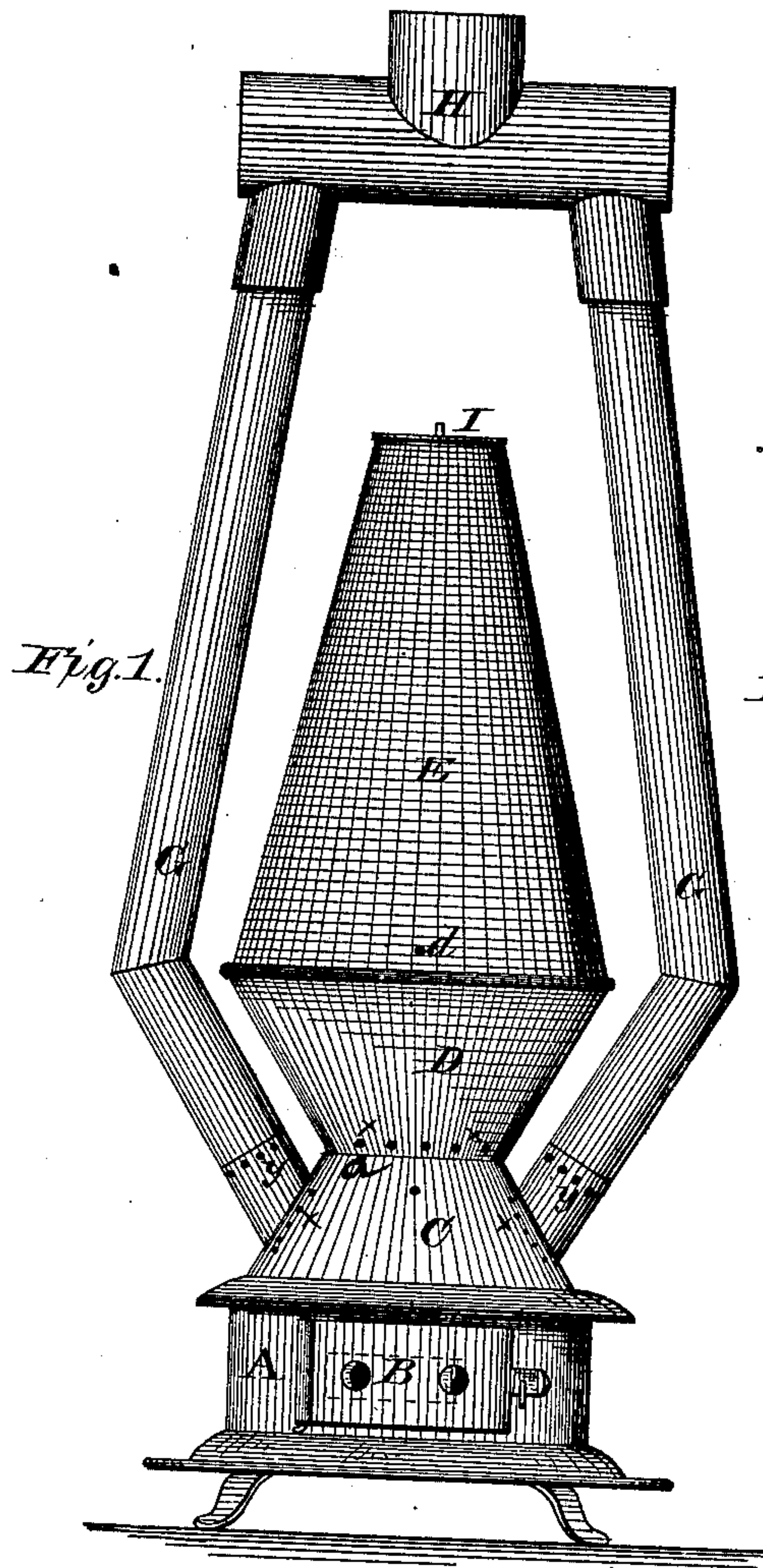


A. C. RAND.  
 Stove and Furnace.  
 No. 196,700.  
 Patented Oct. 30, 1877.



WITNESSES  
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# UNITED STATES PATENT OFFICE.

ALONZO C. RAND, OF MINNEAPOLIS, MINNESOTA.

## IMPROVEMENT IN STOVES AND FURNACES.

Specification forming part of Letters Patent No. 196,700, dated October 30, 1877; application filed September 27, 1877.

*To all whom it may concern:*

Be it known that I, ALONZO C. RAND, of Minneapolis, in the county of Hennepin, and in the State of Minnesota, have invented certain new and useful Improvements in Stoves and Furnaces for Burning Bituminous Coal; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of my invention consists in the construction and arrangement of a stove or furnace to burn soft or bituminous coal, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawing, in which—

Figure 1 is a front elevation of a stove embodying my invention. Fig. 2 is a central vertical section of the same.

The base of the stove forms the ash-pit A, provided with a damper, B. On top of the ash-pit is the combustion-chamber C, made in the form of a truncated cone, and having on top thereof a coking-chamber, D, of similar shape, but inverted, and on top of this coking-chamber D is the elongated conical magazine E, which is to be filled, or partially filled, with coal.

G G are gas-combustion pipes, extending from near the top of the combustion-chamber C, and connecting with the usual stove-pipe H. On top of the magazine E is a damper, I, to increase or diminish the production of gas. The damper B at the front of the ash-pit is to control the combustion of the coke in the chamber C.

It will be observed that the stove thus constructed is contracted at *a*, between the coking-chamber D and the combustion-chamber C. This is made to concentrate the heat passing downward into the chamber C, so that the gas from the magazine E may be constantly subjected to an increased temperature until it finally combines with the oxygen furnished through the apertures *x x*, at and around said contracted portion *a*, and in the side of the

combustion-chamber C around the ends of the pipes G.

To absolutely insure the combustion, I make or provide, at the points where the gas-combustion pipes G are attached to the chamber C, cones *b b*, the orifices in which are about one-fourth the size or area of the pipes G G. This device concentrates the gas and air, both of which are, before this takes place, thoroughly heated, (being in a state of semi-combustion,) and the combination of the oxygen with the carbon is therefore made more certain.

In the ordinary means employed for burning soft coal, the fuel is put on the fire, and the upward draft brings the vapor of the coal, in a state of imperfect combustion, in contact with the comparatively cold coal overlying the fire. The result is, the carbon is cooled, the oxygen cannot combine with it, and lamp-black or dry carbon passes off and smoke is made. Base-burning stoves have been used to overcome this evil, but without success. This failure is attributable to the many chances for escape of the vapor through the coke overlying the grate, and not heated to incandescence.

In these arrangements referred to the base of the magazine holding the coal has not been contracted, and between the pieces of coke under the magazine the vapor has had ample avenues of escape uncombined with the oxygen required for its perfect combustion.

Therefore, it will be observed that one of the main novelties in my invention is the concentration of the vapor and gas, compelling them to pass through the greatest heat in the furnace, and right at the place furnishing it with oxygen. The rapidity with which oxygen combines with carbon is measured by the temperature of both before contact.

The holes *x* at the base of the coke-chamber D, and around the base of the combustion-pipes G, furnish oxygen just where it is required to keep the coke at high heat, and also to furnish air to the gas and vapor.

The grate J at the base of the combustion-chamber C is intended to be a shaking and dump grate of any suitable construction; and through the bars of such grate air is furnished to keep the coke in high state of combustion, so that by this construction the gas and vapor



are taken out of the center of the hottest part of the furnace, combined at once with oxygen, and consumed in the pipes G without any smoke.

At *d* is a hole for the purpose of permitting the insertion of a rod to crowd down the coke, should any lodgment take place in the contracted part of the furnace.

The holes *x*, besides furnishing air to the gas as it passes downward into the combustion-chamber C, also assist in preventing the lodgment of coke in the contracted part *a* of the furnace, by producing combustion of the outer mass of the coke, and by thus decomposing the sides of the coke the weight of the mass of the coke and coal above will crowd down the coke through the contracted part of the furnace into the chamber below. The fire is perfectly controlled by the use of the dampers B and I.

A ring-damper may be applied to the holes in the base of the coking-chamber D to control the admission of air.

To make the combustion of the gas in the pipes G more perfect, other cones, like those shown at *b b*, may be supplied, and holes *y* in the pipes, for the air to be admitted between them, supplied.

The combustion-chamber C may be made of retort-clay, although iron, where one side is exposed to the air, will endure great heat and last a long time.

The advantages of this construction of a stove or furnace can be briefly enumerated as follows: No smoke; great economy, as no heat-producing material is wasted—none escapes; only one fire need to be kindled for a season; the infrequency of supplying with coal, as will be readily seen from the extraordinary size of the magazine as compared with the combustion-chamber; this is not a smoke-burner; the carbon is not permitted to lose its heat and form smoke.

To kindle the fire, the kindlings are put in the top of the stove until they fill up the chamber C, and part of the chamber D. Then fill up with coal and open both dampers I and B. When the fire is well going and the gas is evolved, both dampers are checked. The air entering at the damper I should be very little, only enough to carry down the vapor out of the magazine.

Mica may be used in the gas-pipes G, and quite an illumination maintained.

To keep a fire, a very moderate one, close tight the dampers, and one charge of coal will last a number of days.

Steam passed through under the grate will arise, and the oxygen of the steam combine with the carbon, and the hydrogen of the steam will become liberated and unite with the rich vapors of the coal and prevent smoke. A water-pan in the ash-pit will furnish steam by the radiated heat for this purpose.

The gas-pipes G may also be provided at the top with water-pans having closed covers, and the steam conducted into the magazine, where the downward draft would carry it into and through the incandescent coke, where it would be decomposed.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a stove or furnace, the combination of a conical combustion-chamber with a coking-chamber of inverted cone shape, and exterior gas and flame pipes leading from the combustion-chamber, substantially as herein set forth.

2. The combination of the conical combustion-chamber C, the inverted cone-shaped coking-chamber D, magazine E, exterior gas and flame pipes G, and the air-inlets *x x*, arranged at the junction of the chambers C and D, and at the lower ends of the pipes G, all substantially as and for the purposes herein set forth.

3. The cones *b b*, arranged in the pipes G, for the purposes set forth.

4. The combination of the base A, combustion-chamber C, with grate J, coking-chamber D, magazine E, pipes G, with cones *b*, and the air-inlets *x y*, all substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 17th day of September, 1877.

ALONZO C. RAND.

Witnesses:

ALDEN B. RAND,  
A. T. RAND.