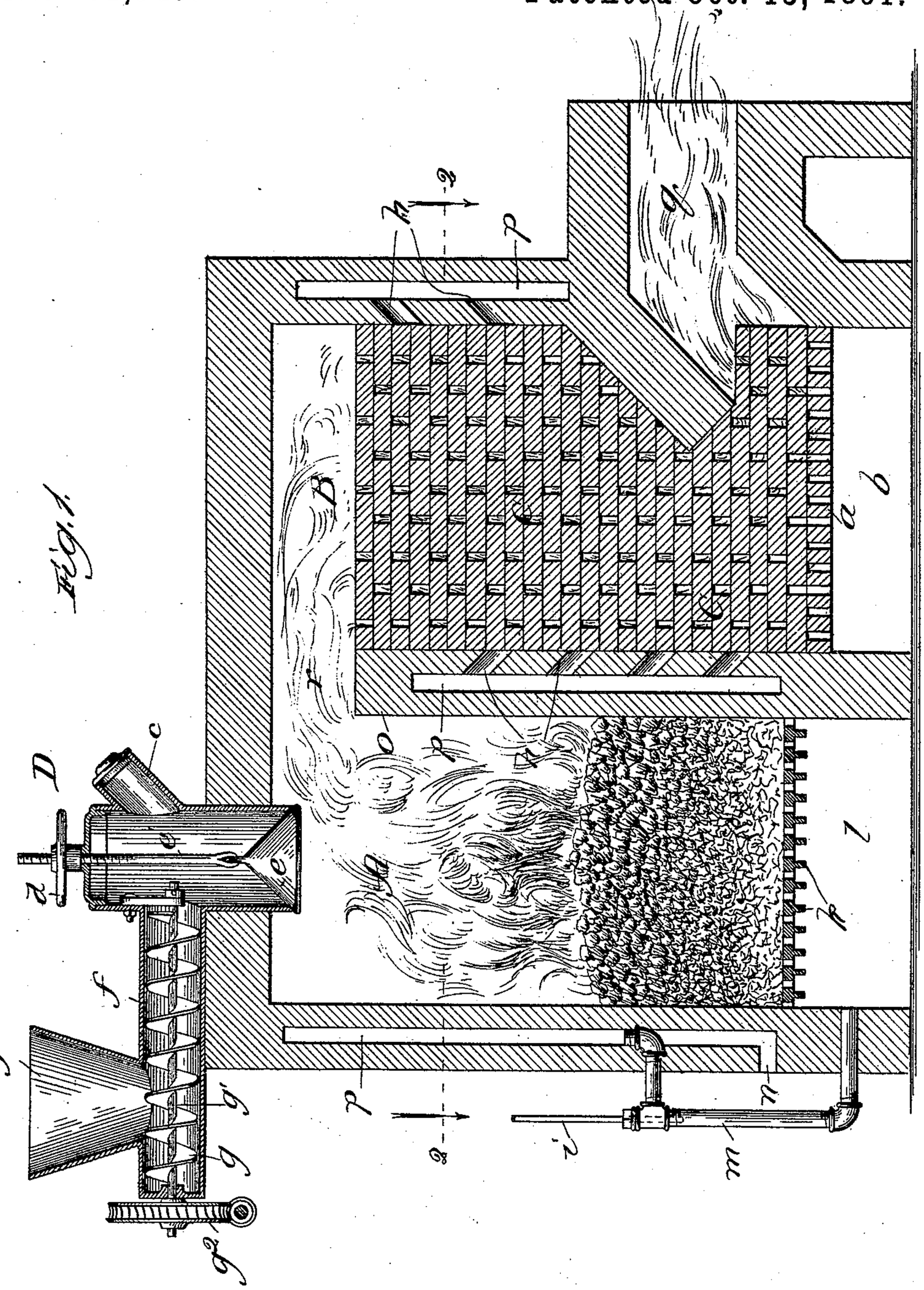
(No Model.) 3 Sheets—Sheet 1.

W. A. KONEMAN.

METHOD OF AND APPARATUS FOR PRODUCING FROM COAL SMOKELESS FLAME FOR HEATING.

No. 461,343. Patented Oct. 13, 1891.



Witnesses:
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Inventor:
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(No Model.) 3 Sheets—Sheet 2.

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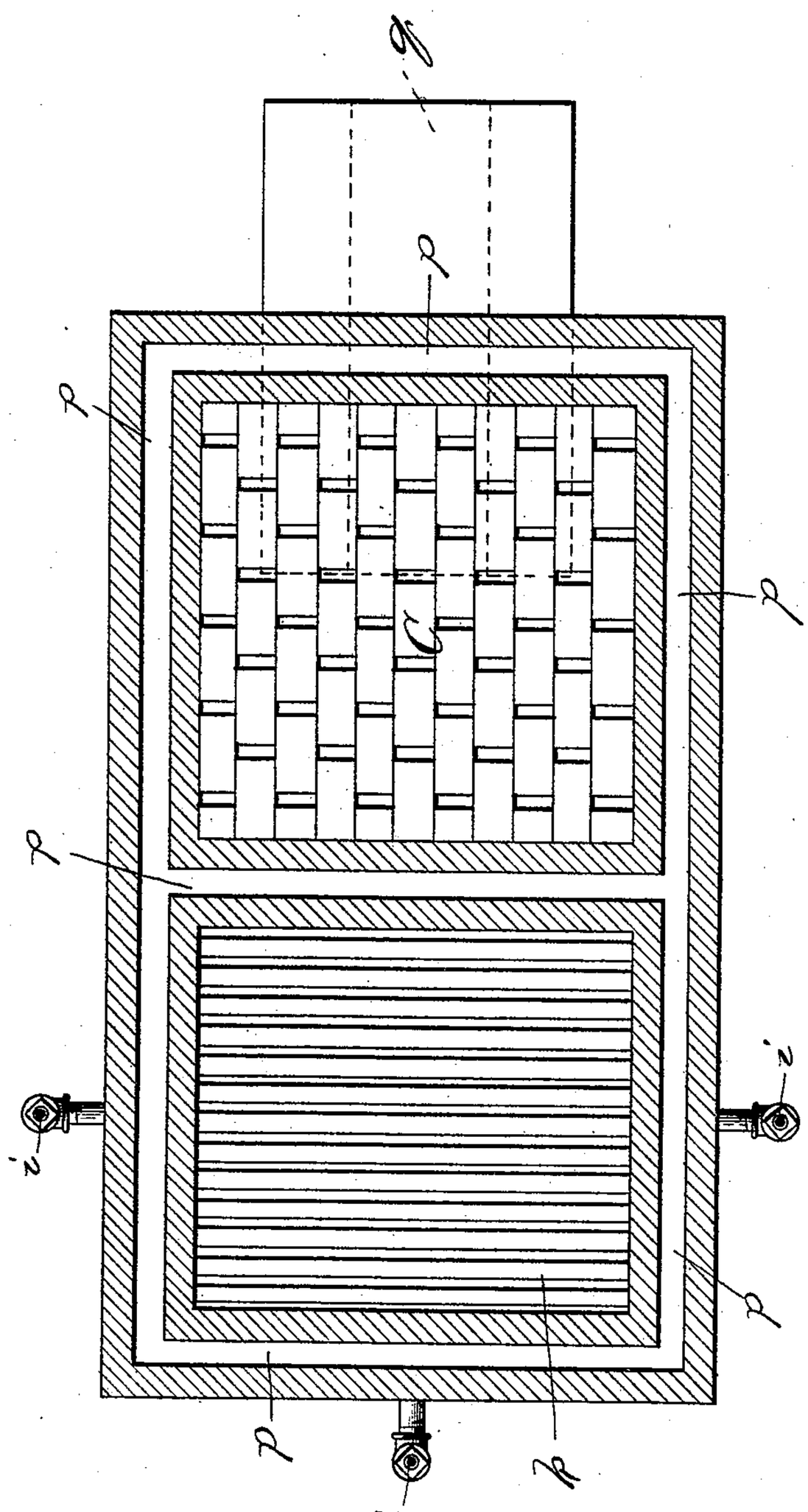

Witnesses:
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(No Model.) 3 Sheets—Sheet 3

W. A. KONEMAN.

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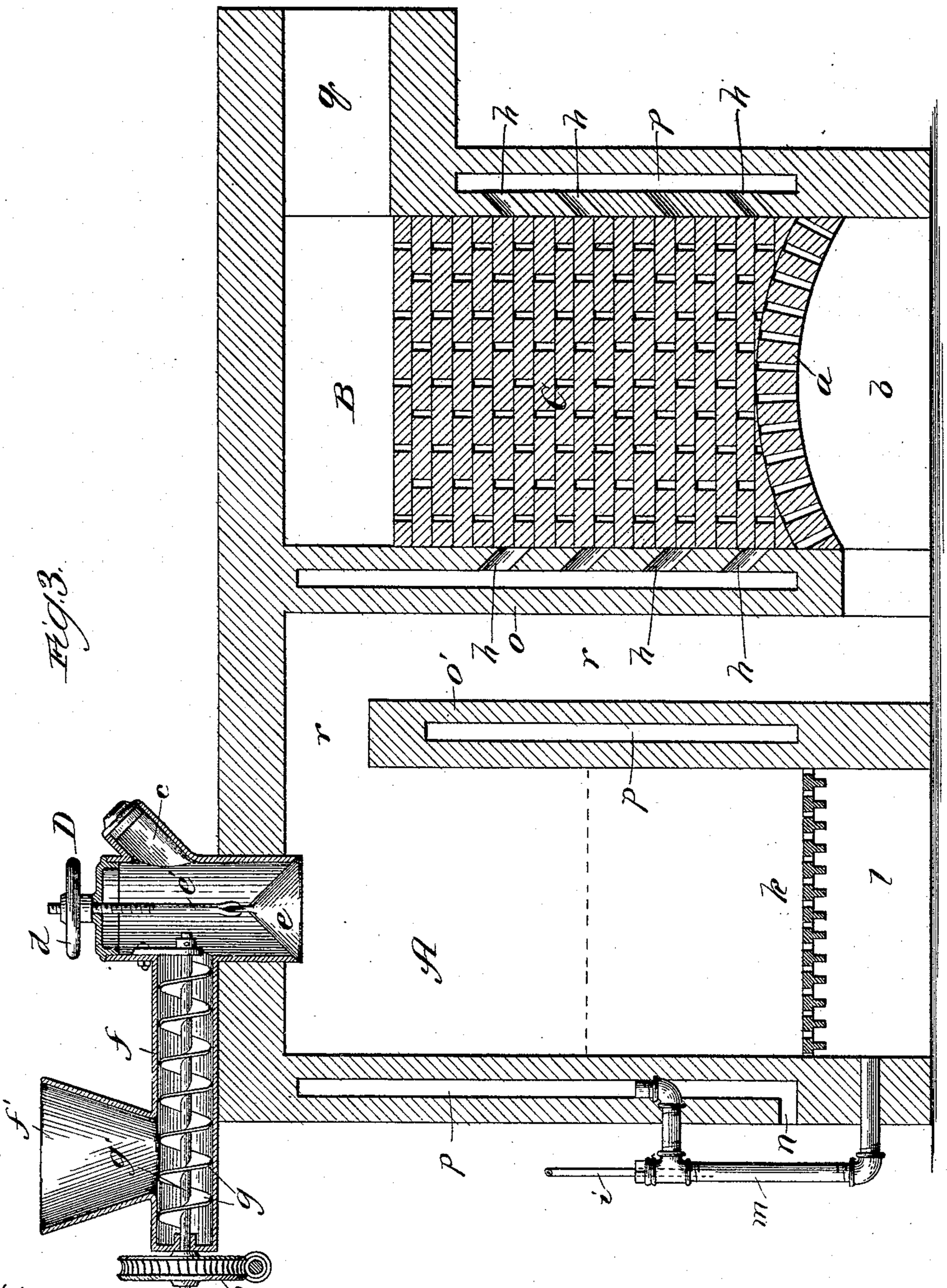

FIG. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM A. KONEMAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CHICAGO HEAT STORAGE COMPANY, OF SAME PLACE.

METHOD OF AND APPARATUS FOR PRODUCING FROM COAL SMOKELESS FLAME FOR HEATING.

SPECIFICATION forming part of Letters Patent No. 461,343, dated October 13, 1891.

Application filed November 3, 1890. Serial No. 370,122. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. KONEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Methods of and Apparatus for Producing from Coal Smokeless Flame for Heating, of which the following is a specification.

The object of my invention is to provide for the combustion of coal in such a manner that by a continuous operation from the point of its ignition it will be reduced to and emerge for direction against an object to be heated (as particularly for welding and forging) in the form of an intensely-hot pure flame.

To practice my improvement, I first build a coal fire on the grate of a fuel-gas producer, supplying to it the necessary oxygen to support combustion, and reduce the bed to a condition of incandescence, then filling the producer upon the incandescent bed with coal (for supplying which I provide automatically operating means) and supplying oxygen, preferably through the media of both steam and air, with the latter heated by the otherwise waste heat of radiation in the walls of the producer, the amount of oxygen supplied being sufficient to reduce the products of combustion in the producer to a fuel-gas. From the producer I lead the fuel-gas into and pass it through a gas-combustion chamber, while continuously supplying air to the latter, preferably at vertically-disposed series of inlets in the walls of the said combustion-chamber, which involves in its construction an interstitial pile of incombustible material supported over an ash-pit, and from an end of which chamber the outlet leads. Like the air supplied to the producer that introduced into the combustion-chamber is also, by preference, first heated by passing it through the air-space in the walls of the chamber.

I show improved apparatus for the practice of my method in the accompanying drawings, in which—

Figure 1 is a view in sectional side elevation; Fig. 2, a plan section taken on the line 2 2 of Fig. 1 and viewed in the direction of the arrows; and Fig. 3 a view like that presented in Fig. 1, but showing a modified construction.

A is the fuel-gas producer, and B is the gas-combustion chamber, both being by preference within the same brick structure (preferably formed of silica brick) and intercommunicating therein through a passage *r*. The only material difference between the constructions presented in Figs. 1 and 3 is that in the former the passage *r* leads into the upper part of the gas-combustion chamber, from which then the flame-outlet *q* leads from its lower portion, while in the latter the passage *r* leads between two internal partitions *o* and *o'* into the lower part of the gas-combustion chamber, whence then the flame-outlet *q* leads from the upper part of the chamber.

The air-spaces *p* in the walls of the structure and in the partition *o*, (or partitions *o o'*,) forming the separation between the chambers A and B, may intercommunicate, as represented in Fig. 2, whereby all may be supplied with air through one or more inlets *n*. An air-pipe *m* leads from the hot-air supply in the front wall of the structure into the ash-pit *l* below the grate *k* in the producer A, and I lead a steam-pipe *i* from the steam-supply (not shown) into the upper end of the pipe *m*. Several pipes *m* may be used, as indicated.

C is the interstitial pile of incombustible material in the form of checker-work in the combustion-chamber B, and *h* denotes the air-inlets from the air-spaces in the walls of the combustion-chamber, leading into the latter at different points of elevation on the pile C, whereby oxygen may be fed into the gas at different stages of its combustion while passing through the pile.

The apparatus I provide for feeding the coal is located above the producer-chamber A and comprises a worm *g* on a shaft *g'*, carrying a gear g^2 at one end and confined in a cylinder *f*, into which leads from above a hopper *f'*. The cylinder communicates at its open end with the side of a supplemental hopper D, covered at its upper end and leading at its lower end into the top of the chamber A, wherein it is provided with a conical valve *e*, adapted to fit the lower end of the hopper and suspended on a rod *e'*, extended through the cover, where it is threaded and adjusted to effect closing or opening of the valve by a nut in the form of a hand-wheel *d*. The hop-

per D is also provided with a lateral feed-chute *c*, adapted to be hermetically closed at its outer end and serving to admit the coal to the hopper when the worm is not operative or being used, in which case the valve *e* is closed before opening the chute *c* to prevent escape of gas being generated in the producer. After the closure the cover of the chute *c* is removed to permit the hopper D to be filled through it with coal, after which the chute is close and the valve opened by lowering it to permit the coal to discharge into the producer.

The operation is as follows: A fire is built on the grate *l* and allowed to burn till it forms an incandescent bed of coal. Then the supply of coal is admitted through the hopper D and steam introduced with the air through the pipe or pipes *m*, and forced through the material on the grate. This reduces the products of combustion in the producer to a fuel-gas, which is carried through the passage *r* into the gas-combustion chamber B, wherein it passes (downward with the apparatus as shown in Fig. 1 and upward with that shown in Fig. 3) through the interstitial pile C, emerging thence through the outlet *q* as a pure or smokeless and intensely hot flame. In passing through the interstices of the pile C the gas deposits the tar and other hydrocarbons, which with the gas and such fine particles of coal as are carried over with it are subjected to thorough combustion. Any ashes resulting from the combustion in the pile C of the coal particles may drop into and be removed from time to time from the pit *b* provided below the support *a* for the interstitial pile. As the fuel-gas product of the producer passes through the interstices of the pile C air is constantly fed to it to support the combustion, thereby creating an intense heat, which reduces the pile to and maintains it in a condition of incandescence; and as the products of the gas combustion proceed toward the outlet through the pile they are met at different points as the degree of their combustion increases with additional supplies of the air from the ports *h*. Thus when the products of combustion eventually reach the outlet the fuel-gas from which they are generated is reduced to an intensely hot pure flame, which emerges from the outlet to be directed against the object to be subjected to its heat.

What I claim as new, and desire to secure by Letters Patent, is—

1. The method of producing from coal by a continuous operation an intensely-hot pure flame for direction against an object to be heated, which consists in generating fuel-gas by burning coal in a producer and leading the resultant fuel-gas vertically through an interstitial pile of incandescent incombustible material in a combustion-chamber to an outlet and supplying oxygen through the said combustion-chamber and pile to the products of combustion substantially throughout the entire extent of their course in passing through the same at different points of elevation with relation to the said outlet, whereby as the products of the gas combustion proceed toward the outlet they are met at different points as the degree of their combustion increases with additional supplies of oxygen, substantially as and for the purpose set forth.

2. In an apparatus for producing from coal an intensely-hot pure flame for direction against an object to be heated, the combination of a fuel-gas producer A, provided with means for continuously supplying oxygen to it, and a combustion-chamber B, communicating with the discharge end of the producer and containing an interstitial pile C of incombustible material between its inlet and outlet and having air-inlets *h* in its wall at different points of elevation with relation to the outlet throughout the course of the products of combustion through the interstitial pile for continuously supplying oxygen to the combustion-chamber, substantially as set forth.

3. In an apparatus for producing from coal an intensely-hot pure flame for direction against an object to be heated, a producer A and a combustion-chamber B, communicating with each other, air-spaces in the walls communicating with the outer air, a grate *k*, and an ash-pit *l* in the producer, an interstitial pile C of incombustible material surmounting an ash-pit *b* in the combustion-chamber between its inlet and outlet and communicating with the said air-spaces at different points throughout the course of the products of combustion, an air-pipe *m*, leading from an air-space into the ash-pit *l*, and a steam-supply pipe *i*, substantially as described.

WILLIAM A. KONEMAN.

In presence of—
J. W. DYRENFORTH,
M. J. FROST.