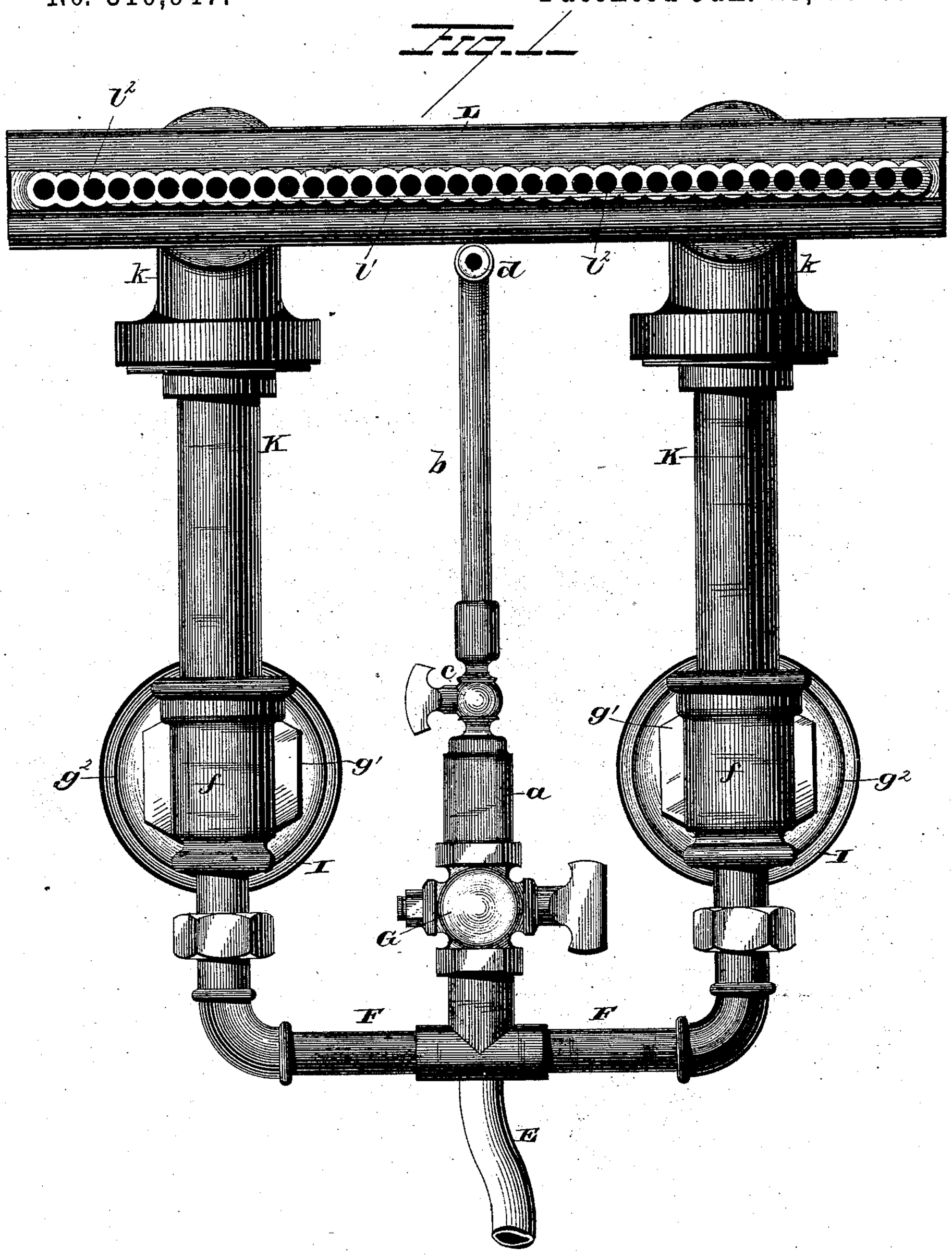
(No Model.) 3 Sheets—Sheet 1.

W. M. JACKSON.

GAS STOVE.

No. 310,947. Patented Jan. 20, 1885.

FIG. 1.



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(No Model.) 3 Sheets—Sheet 2.

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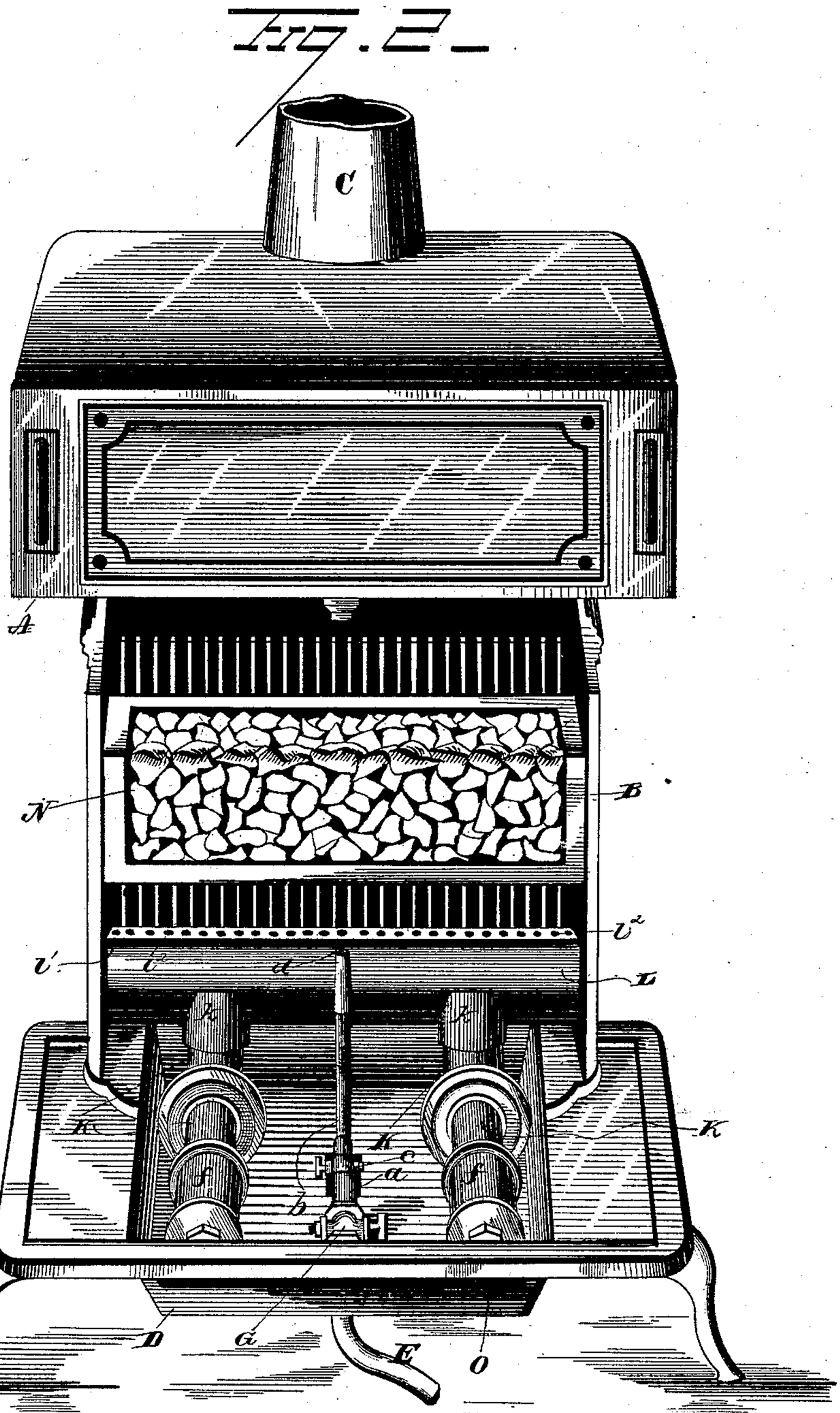
Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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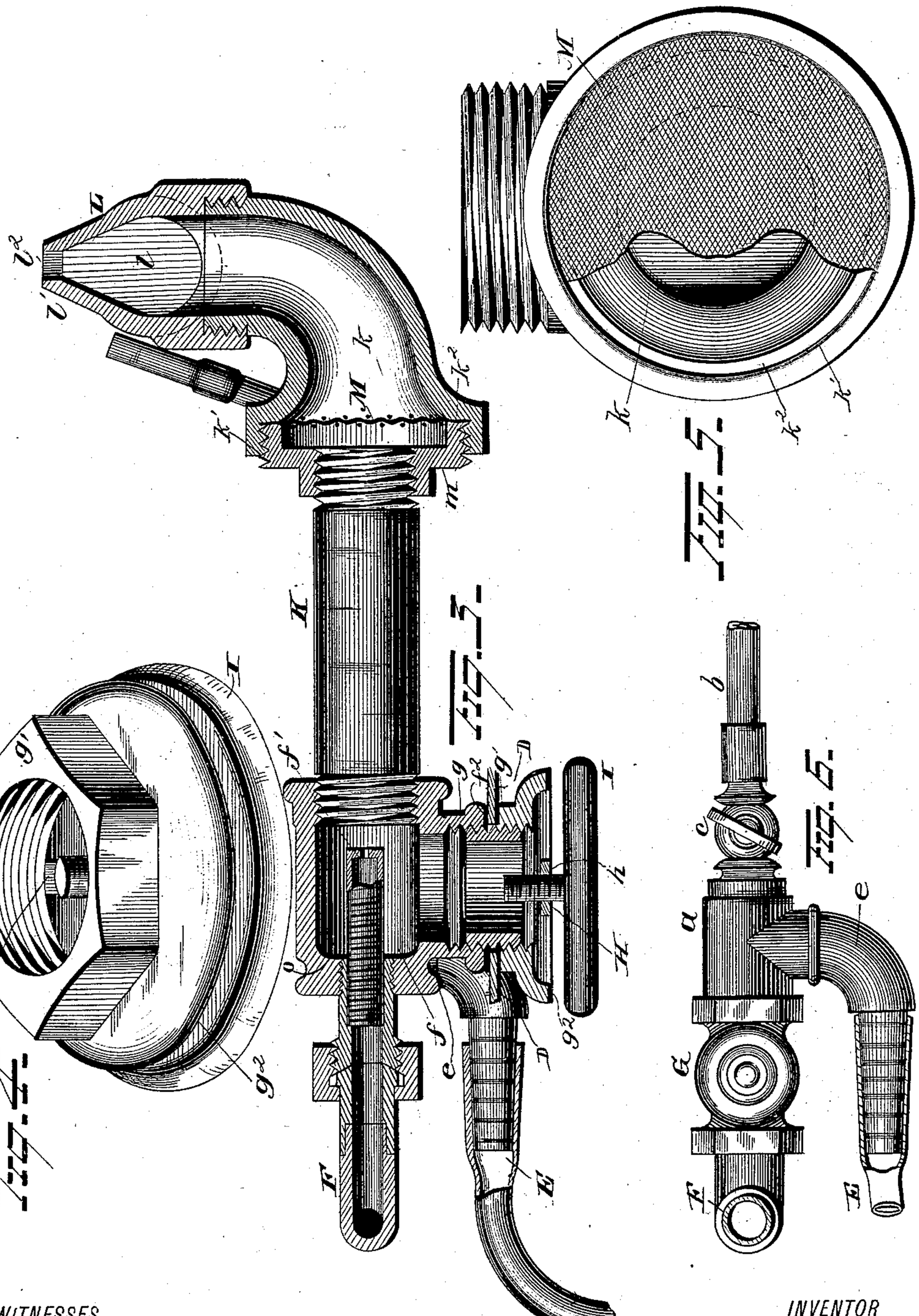

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UNITED STATES PATENT OFFICE.

WALTER MARSH JACKSON, OF PROVIDENCE, RHODE ISLAND.

GAS-STOVE.

SPECIFICATION forming part of Letters Patent No. 310,947, dated January 20, 1885.

Application filed May 28, 1884. (No model.)

To all whom it may concern:

Be it known that I, WALTER MARSH JACKSON, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Apparatus for Utilizing Heat Developed by Combustion; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in apparatus for utilizing heat developed by combustion. It is a well-known fact that heat may be partially obstructed in its passage through a stove, range, or fire-pot, such as is in ordinary use, and eliminated from the products of combustion, which pass off through the flues by the interposition of diaphragms, siphons, dampers, or by the use of extended or circuitous stove-pipes; but it is not found practicable to wholly arrest the developed heat, as some loss must necessarily occur in conducting the products of combustion out of the room, where they can exert no prejudicial effect upon life. In order to more fully obstruct the heat for utilization and obtain a slow and more perfect combustion of the fuel employed without danger of explosion, I proceed substantially as follows: I fill a fire-pot with any suitable refractory material—broken fire-brick, for example—and place under the refractory material one or more burners. If the gas or vapor be luminous, I destroy its luminosity by an admixture of steam or air before it is ignited. If the fuel be non-luminous, of course this will not be necessary. The vapors of volatile oils, carbureted air, carbureted water-gas, petroleum, and coal gases are examples of the former, while alcohol and what is known commercially as "water-gas," a diffused mixture of hydrogen and carbonic oxide, may be taken for examples of the latter. Having thus secured the advantage of a smokeless flame, I can burn the same between the interstices of the refractory material without choking the interstitial spaces with a deposition of lamp-black or unconsumed carbon, and thus insure continuous and free draft with more perfect combustion. To insure constant combustion and prevent the danger of explosions, I provide a permanent opening below the surface of the refractory material for the ingress of fresh air, and this opening is so arranged that it cannot be closed unless a deliberate attempt be made so to do by a willful effort to destroy the utility of the process. It will readily be seen that where combustion takes place largely below the grate-bars and beneath the refractory material, following up into the spaces between the fragments of the refractory material, an adequate supply of air must be never-failing; otherwise the flame might be extinguished by superabundant carbonic acid and the absence of oxygen, while the gas or vapor would continue to be supplied, thus filling the stove, fire-pot, flues, and chimney with a combustible material which, when exposed to air by opening the apparatus at any point, would violently explode upon contact with a flame. Therefore the permanent nature of the opening for the constant ingress of air is of the utmost importance.

The object of my present invention is to provide an apparatus for reducing my method above outlined to practical purposes, the method itself forming the subject-matter of a separate application filed heretofore and now pending.

With this object in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of my apparatus. Fig. 2 shows the same applied to a stove. Fig. 3 is a vertical section through one of the branch feed-pipes, showing the gas-supply pipe E beyond. Fig. 4 is a detached view of one of the air-feed valves, and Fig. 5 is a detached view of the enlarged chamber provided with a fire-stop. Fig. 6 is a detachable view of the coupling for the attachment of the gas-supply pipe.

A represents a cooking-range, which may be of any form and construction, the particular form of apparatus represented in this case being adapted to a stove or range in which the fire-pot is oblong, oval, or the like in shape.

B is the fire-pot, and C is a draft-flue connecting the space above the fire-pot with the outside air.

Within the ash-chamber, commonly formed in the hearth, or any suitable receptacle, D, located in front of or below the fire-pot, is

placed the apparatus for supplying air and gas to the fire-pot.

E represents a supply-pipe, through which gas, which may consist of the vapors of volatile oils, carbureted air, carbureted water-gas, petroleum, and coal gases, a mixture of hydrogen and carbonic oxide, &c., is supplied to the burner. The pipe E is coupled onto the branch *e* of a T-coupling, *a*, to which is connected the small tube *b*, provided with a stop-cock, *c*, and with a pilot-burner, *d*, at its outer end. By means of the stop-cock *c* the supply of gas to the pilot-burner may be regulated as desired.

To the other end of the T-coupling *a* the branch pipes F F are connected, the ends of which enter the enlarged chambers *f f* and constitute injector-nozzles *f' f'*, for the purpose of commingling air and gas and forcing the mixture onward to the burner, as will be hereinafter explained.

G is a stop-cock for admitting gas to the chambers *f f*, or for cutting it off therefrom. The injector-chambers *f* are each formed with a coupling, *g*, which extends downwardly through an opening in the lower wall of the chamber, and projects below the same a distance sufficient to admit of the attachment of the check-nut *g'*. The check-nuts *g'* serve to firmly secure the apparatus against displacement. For example, when the apparatus is placed in a hearth-recess, as represented in Fig. 2, the shoulder f^2 about the perforation in the lower wall of the chamber *f* will rest in contact with the upper surface of the bottom of the recess, while the check-nuts *g'* will engage the lower surface of the bottom. The nuts *g'* are constructed with annular flat seats g^2 on one end, and are also provided with cross-bars H, having screw-threaded central openings, *h*. I represents a hand-valve provided with a central screw that engages the opening *h* in the nut. By rotating the valve I it may be adjusted so as to admit any desired quantity of air to the injector and commingling chamber. Different kinds of gas require different quantities of air to be mixed therewith to insure perfect combustion, and hence by the employment of the hand-valves I the proper quantity of air for different kinds of gas and for varying conditions of pressure or quantity of gas can be admitted and the most perfect combustion readily obtained. The combustible mixture of air and gas is conveyed to the burner L by the pipes K, and admitted to the burner near the opposite ends thereof. The burner L is constructed with a continuous chamber or elongated receptacle, *l*, in its lower portion, and with a contracted upper portion, *l'*, provided with a series of perforations, l^2, through which the mixture of air and gas flows in jets and is ignited. Each pipe K is provided with an enlarged chamber, *k*, located between the burner and injector-chamber. The chamber *k* consists, essentially, of an enlarged socket, *k'*, preferably threaded and interposed between two sections of the pipe K. Socket *k'* is provided with an annular shoulder, k^2, on which is placed a wire-gauze diaphragm, M, the meshes of which are of such a size as to allow of the free passage of the gas, and yet prevent the backward passage of a flame, thus preventing the ignition of the gas or explosive mixture contained in the supply-pipe in the rear of the diaphragm. A coupling, *m*, is screwed into the socket *k'*, the end of the coupling engaging the outer edge of the wire-gauze diaphragm and retaining it in its place. As the wire-gauze would necessarily obstruct and impede the flow of gas were it of the same diameter as the supply-pipe, the enlarged chamber *k* is provided to admit of the employment of a diaphragm of such diameter that the combined area of the interstices in the diaphragm will be equal to the area of a cross-section of the supply-pipe, thus insuring a free and unobstructed flow of the gas to the burner. The fire-pot B is filled or partially filled with refractory material N, against which the jets of the burner impinge. The refractory material may consist of broken pieces of fire-brick or any other suitable material. The purpose of this refractory material is to arrest the heat developed by the combustion of the gas, and having become heated to a high degree communicate the heat to cooking-vessels in a manner similar to that of a bed of red-hot coals, or radiate the heat throughout the room, or fulfill any of the purposes to which an ordinary cooking or heating stove may be adapted. A small supply of gas is supplied to the pilot-burner, which is kept constantly ignited, or ignited before the gas is allowed to enter the burner L, for the purpose of instantly igniting the gas when supplied to the main burner. Should the pilot-burner be dispensed with and the gas turned on to the main burner and lighted with a match, there would be great danger of an explosion, as such an operation would result in a sudden accumulation of gas throughout the interstices in the refractory material and in the fire-pot, and were this accumulated supply suddenly ignited a disastrous accident might result therefrom; but by the employment of a pilot-burner such an accident is avoided, since if the pilot-burner is kept constantly ignited, which is the better and safer plan, whenever any gas escapes from the main burner it will be at once ignited, and an accumulation of gas in the fire-pot, stove, or flues obviated.

The stove or range is provided on its under side with a permanently-open draft-opening, O, while the pipe C constitutes a permanently-open exit-flue and permanent draft. The permanent draft established by the opening O and the exit-flue C, which connects with the outside air—that is to say, the air outside of the compartment or building—is a very important feature, as it not only provides for carrying off the results of combustion, which are prejudicial to life, but causes the jets of burning gas to completely occupy the interstices

between the pieces of refractory material, and draws a sufficient amount of air through the permanent opening O to complete any partial combustion that may have taken place at the jets, and at the same time prevents an accumulation of gas from any cause below the fire-pot.

The stop-cock *c* is adjusted so as to maintain a continuous limited flow of gas to the pilot-burner. By opening the cock G a supply of gas is admitted to the branch pipes F, and issues with sufficient force from the injector-nozzles *f'* to cause a partial vacuum in the surrounding annular chambers *o* in the chambers *f* of the injectors, and thus draw into the chambers a supply of fresh or outer air through the air-supply openings, which extend through the bottom of the stove or range, the air-supply being regulated by the hand-valves I. The gas and air are thoroughly mixed and commingled in the chambers *f*, and this mixture is forced into the burner, from whence it issues in jets and is instantly ignited by the pilot-burner. The jets impinging against the refractory material and drawn through the spaces between the pieces thereof stores heat therein, which is used for heating, cooking, &c., as may be desired.

I do not limit myself to the form and construction of burner shown and described, and while I have shown and described the apparatus as applied to a common cooking-range, it may be applied in numerous ways in cooking or heating stoves constructed expressly for its employment.

I am aware that it has been proposed to provide a stove with ordinary illuminating-gas burners located below a receptacle filled with refractory material, the stove being furnished with a permanent-draft opening and a permanent outlet communicating with the outer air; also, that it has been proposed to provide a stove with burners for the use of diluted gas or non-luminous gas, the burners being arranged beneath a receptacle filled with refractory material, and the stove to be provided either with a permanent-draft opening or with a pipe communicating with the outer air, and hence I make no claim to such construction of apparatus.

I make no claim in this patent to the method of utilizing the heat developed by the combustion of gas as herein described, as it constitutes the subject-matter of a separate application filed by me April 19, 1884, Serial No. 137,166.

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

1. In a heating or cooking stove, the combination, with a fire-pot or receptacle filled with refractory material and provided with a permanently-open air-draft below the refractory material and a pipe forming a communication between the chamber above the refractory material and the outer air, of a burner located below the refractory material and a commingling-chamber and valve for supplying mixed air and gas to the burner for producing a non-luminous or nearly non-luminous flame, substantially as set forth.

2. The combination, with a stove provided with a fire-pot filled with refractory material, of a burner located below the fire-pot, gas and air injector, and commingling-chamber and valve for regulating the relative supply of air and gas to the burner, and an enlarged chamber provided with a safety-diaphragm interposed between the burner and the commingling-chamber, the several parts being constructed and arranged substantially as and for the purpose set forth.

3. The combination, with a burner consisting of an elongated chamber provided with a series of holes or jet-openings, of two gas and air injector and commingling chambers communicating with the opposite ends of the burner, valves for regulating the relative supply of air and gas, safety-chambers interposed between the injector and commingling chambers and burner, and a single gas-pipe for supplying gas to both of said chambers, substantially as set forth.

4. The combination, with a receptacle or fire-pot filled with refractory material, a burner located below the fire-pot and provided with a series of holes or jet-openings, gas and air commingling chambers communicating with the burner, and valves for regulating the relative supply of air and gas to the burner, of a pilot-burner located in close proximity to the main burner and secured to a separate and independent gas-supply pipe, and a separate stop-cock for regulating the supply of gas to the pilot-burner, substantially as set forth.

5. The combination, with a stove, a burner, and gas and air injector and commingling chamber located within the stove, of an air-supply coupling extending through an opening in the wall of the stove and provided with a hand-valve on its outer end, substantially as set forth.

6. The combination, with a stove and devices for supplying gas to the stove, of air-supply couplings extending through the wall of the stove, and check-nuts constructed to engage the couplings and lock the gas-supply apparatus to the stove and at the same time form valve-seats for hand-valves, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WALTER MARSH JACKSON.

Witnesses:
J. DEAN BENTON,
CHAS. H. JACKSON.