

(No Model.)

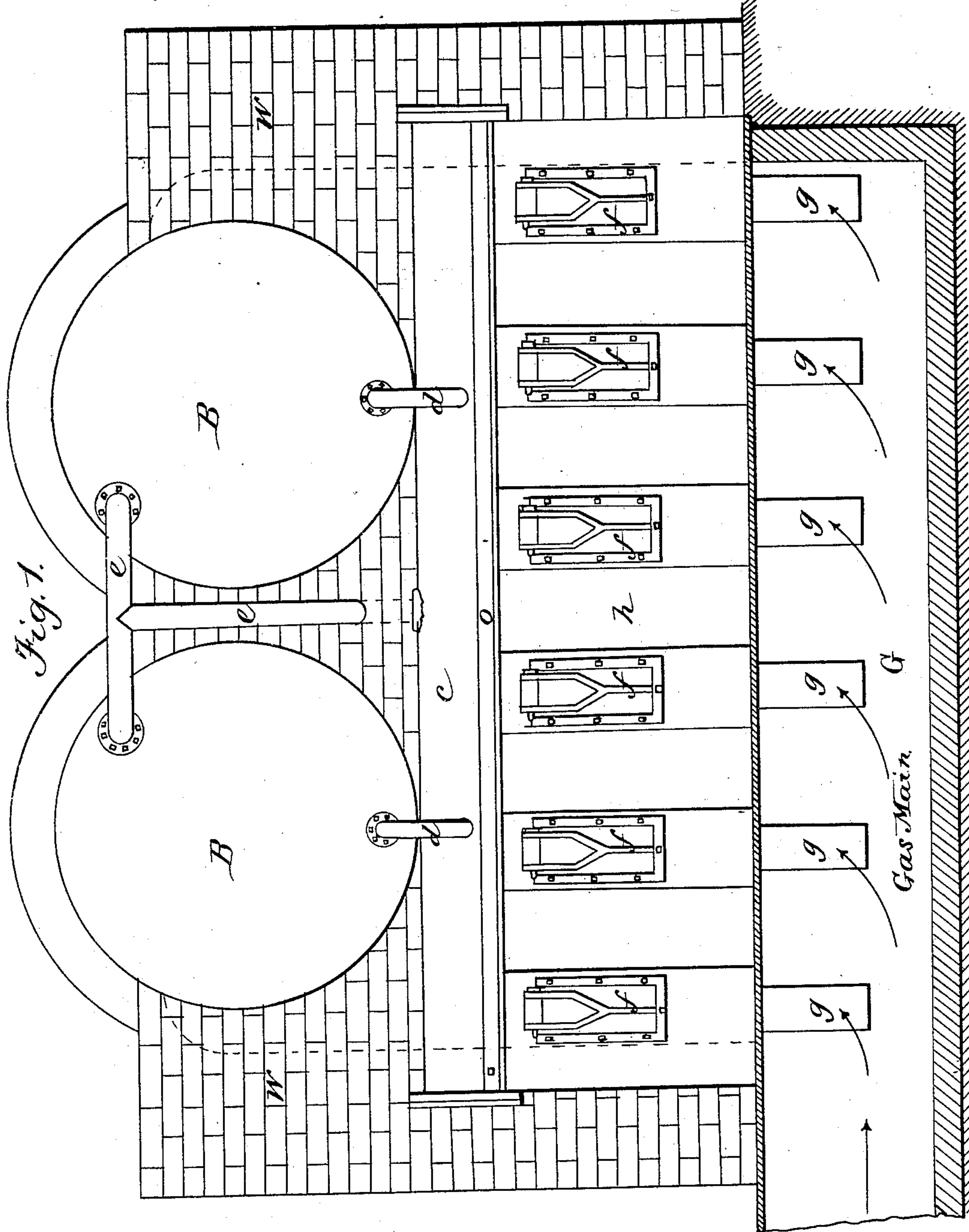
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E. A. UEHLING.

FURNACE FOR BURNING GASEOUS FUEL.

No. 318,328.

Patented May 19, 1885.



Witnesses:

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Inventor:

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(No Model.)

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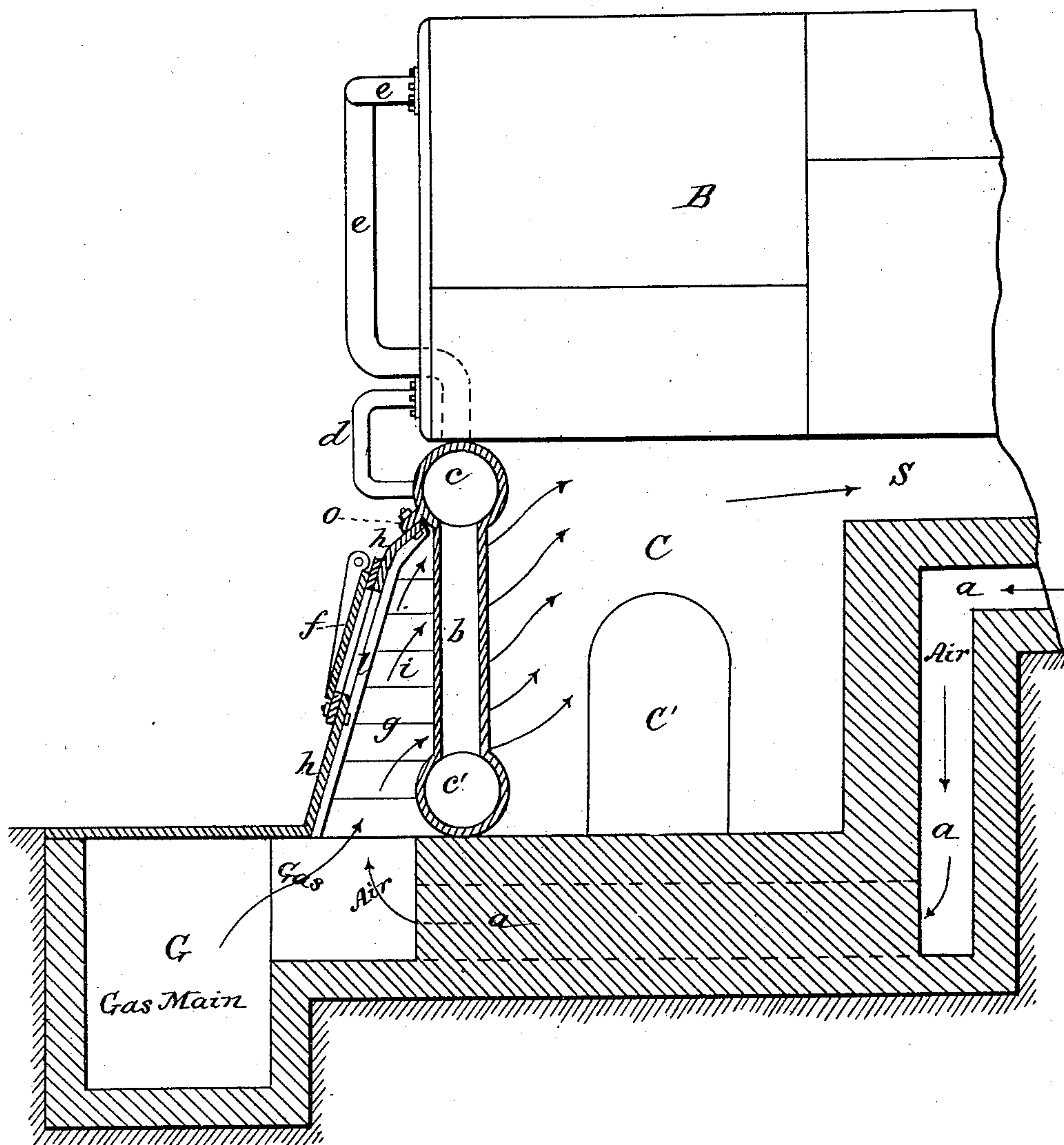
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## FURNACE FOR BURNING GASEOUS FUEL.

No. 318,328.

Patented May 19, 1885.

*Fig. 2.*



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(No Model.)

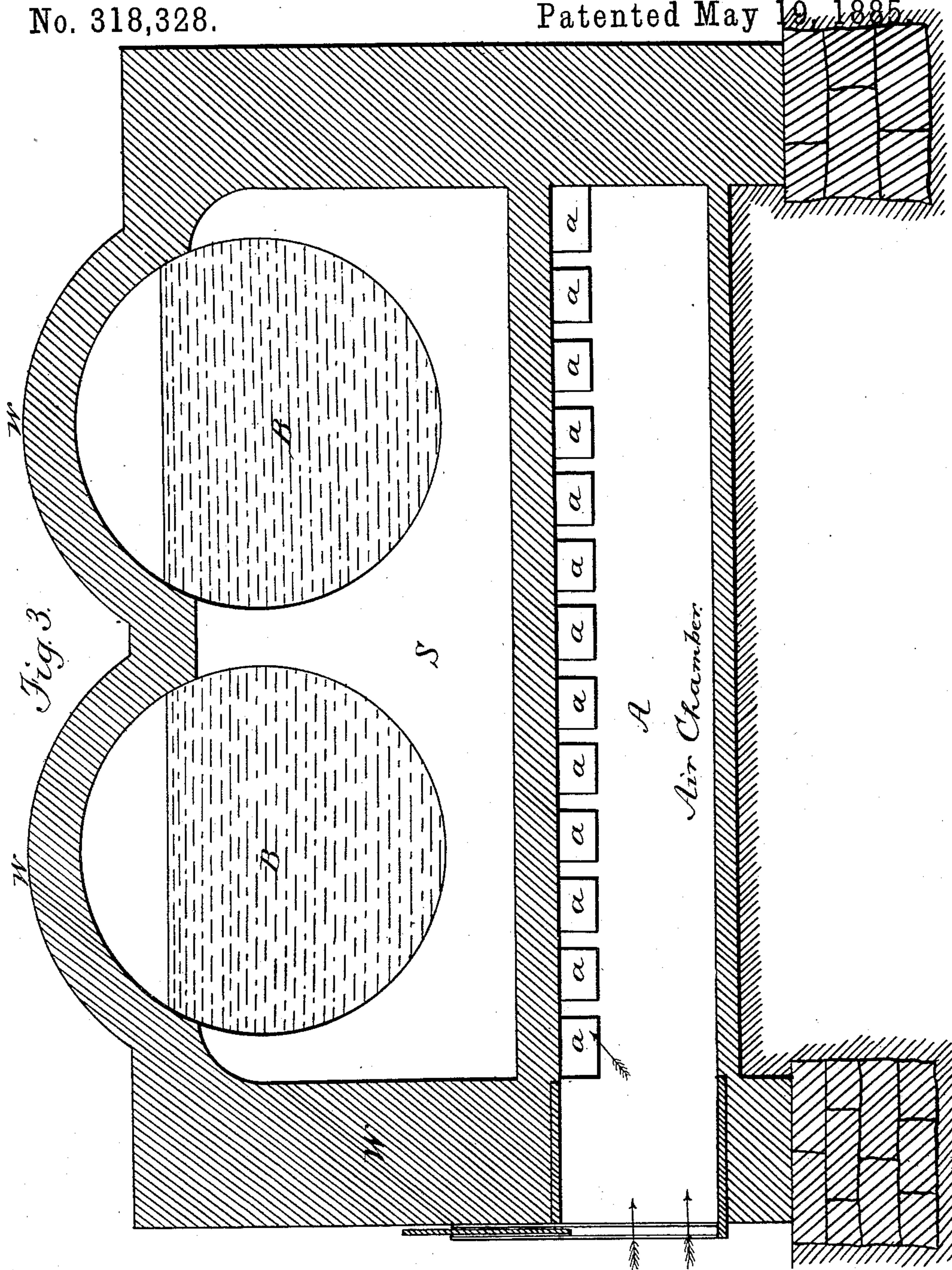
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FURNACE FOR BURNING GASEOUS FUEL.

No. 318,328.

Patented May 19, 1885.



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(No Model.)

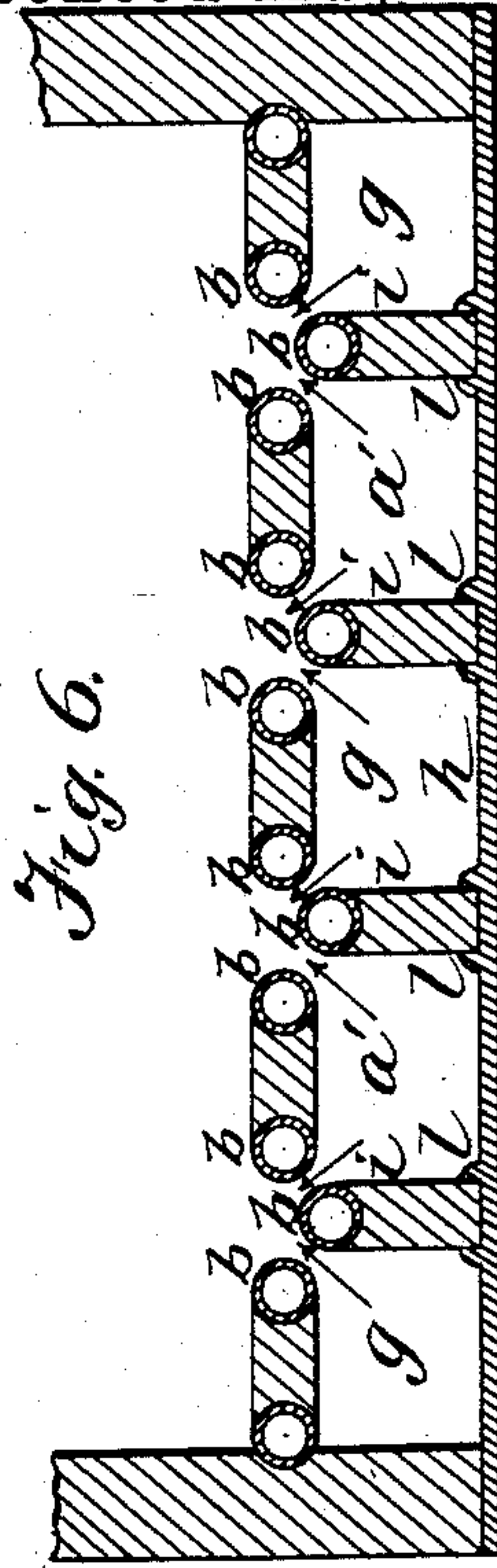
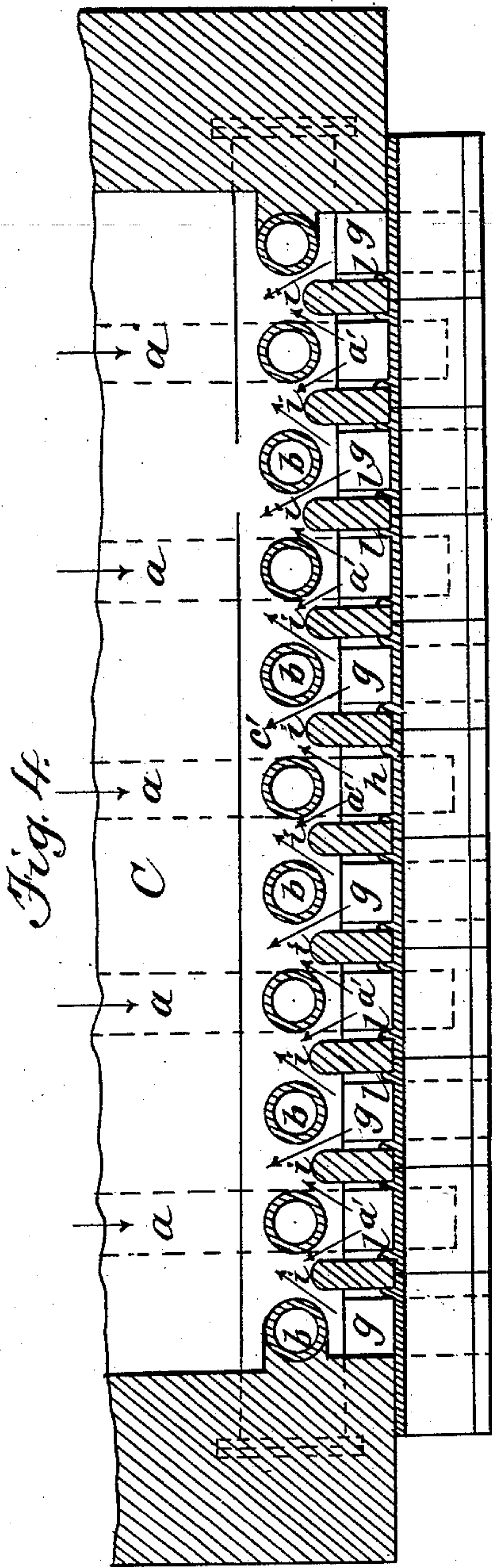
4 Sheets—Sheet 4.

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FURNACE FOR BURNING GASEOUS FUEL.

No. 318,328.

Patented May 19, 1885.



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# UNITED STATES PATENT OFFICE.

EDWARD A. UEHLING, OF BETHLEHEM, PENNSYLVANIA.

## FURNACE FOR BURNING GASEOUS FUEL.

SPECIFICATION forming part of Letters Patent No. 313,323, dated May 19, 1885.

Application filed July 12, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD A. UEHLING, a citizen of the United States, residing at Bethlehem, in the county of Northampton and State of Pennsylvania, have invented new and useful Improvements in Furnaces for Burning Gaseous Fuel, of which the following is a specification.

This invention relates to furnaces in which a gaseous fuel is employed as a heat-producing agent; and the said invention consists of a peculiar novel construction of the burners for the purposes intended, having special reference to a perfect commingling and combustion of the gaseous fuel, the utilization of the heat generated, and the durability of the parts. By "burners" is meant the orifices or openings where the gas and air meet, are commingled, and combustion of the same takes place.

Referring to the accompanying drawings, Figure 1 represents a front elevation, partly in section, Fig. 2 a sectional side elevation, and Fig. 3 a vertical transverse sectional elevation, of the furnace and burner for gaseous fuel, constructed according to the invention as applied to a battery of two cylindrical boilers, arranged to burn the waste gases of a blast-furnace. Fig. 4 is a horizontal section of a portion of the front of the combustion-chamber of a furnace, showing the burners as applied thereto; and Figs. 5 and 6 represent similar views, Fig. 6 illustrating a modification in the construction of the burners.

B B represent two ordinary cylindrical boilers, arranged in the usual or any preferred manner within the absorption-chamber S, and having the surrounding walls W. Beneath the front of these boilers B is the combustion-chamber C, having a door, C', for admittance to the same. At the front of this combustion-chamber C are arranged the burners for the gaseous fuel.

Beneath the front end of the boilers B, and connected with the steam-space thereof by a pipe, e, and with the water-space by a pipe, d, is arranged a horizontal pipe, c, and at the bottom of the chamber C is a similar pipe, c'. These horizontally-arranged pipes c and c' are connected by a series of vertically-arranged pipes, b, placed a suitable distance apart, as shown in Figs. 2 and 4. By reason of these

pipes being connected with the boilers a circulation of water is maintained therein, and consequently they are always kept from being unduly heated, and thus prevented from burning out. So, also, by reason of these pipes the water-heating space of the boiler is considerably increased, for the pipes really form a continuation or extension of the boilers.

Directly in front of the vertical pipes b is arranged a series of partitions or abutments, i, formed of fire-brick, which extend from the front plate, h, in position between the said pipes, as shown in Figs. 4, 5, and 6. These fire-brick partitions are held in place by flanges l, formed on the plate h, which plate in turn is held by a flange, o, on the pipe c. These abutments and pipes are provided to form a series of separate burner entrances or inlets for the gas and air, as will hereinafter appear. The front plate, h, of the combustion-chamber is provided with a series of openings having doors f, for cleaning the burners, as seen in Fig. 1, and at the front of the furnace is the gas-main G, which connects with every alternate space formed by the partitions i through a narrow opening or channel, g, Figs. 1, 2, and 4.

A is the air-chamber arranged at the rear of the furnace beneath the absorption-chamber S thereof, and connecting with every alternate space between the partition-walls i, the same as the gas-main G, by a series of channels, a, formed in the furnace-wall and extending around beneath the absorption and combustion chamber C, and entering every alternate space between the partitions i, as shown in Fig. 4. By reason of the air having been conducted from the rear of the furnace in contact with the heated walls of the absorption and combustion chambers, it is supplied to the burners in a preheated condition, and this heating of the air is effected by the utilization of heat that is usually lost—viz., the heat absorbed by the furnace-walls from the absorption and combustion chambers.

The operation of the parts is as follows: The waste gas from a blast or similar furnace entering the conduit G under pressure is conducted by the narrow inlets g to every alternate space between the partitions i, from whence it passes around the pipes b in divided



streams to the combustion-chamber C. At the same time a stream of air enters from the conduit A, passes through inlets *a*, is heated, enters every alternate space *a'* between the partitions *i*, and escaping around the vertical pipes *b* in thin streams into the combustion-chamber C. The vertical partitions *i* are arranged to project sufficiently between the pipes *b* to form a narrow passage on each side of each pipe for the gas and air, whereby the said gas and air are caused to enter the combustion-chamber in the proper proportions in the form of thin sheets. The gas and air being delivered from every alternate opening over and around the water-protected pipes between the abutments, the streams of gas and air meet and commingle with each other, as shown in Fig. 5, thereby insuring a complete combustion of the same.

It has been stated above that the gas and air enter the combustion-chamber; but such, in reality, is not the fact, for the ignition of the gaseous fuel very largely takes place at the entrance *g* to the combustion-chamber between the vertical pipes *b*. For this reason said pipes are subjected to a great degree of heat, and would soon be destroyed were it not for the circulation of water therein, as hereinbefore described. By reason of the gas and air being caused to enter in a thin sheet a perfect commingling of the same is the result, and therefore a greater heat without loss is obtained.

Instead of having the plate *h* with the lugs *l*, for supporting the fire-brick *i*, as shown in Figs. 4 and 6, the plate may be dispensed with and the entire front of the furnace formed of fire-brick, as shown in Fig. 5; so, also, instead of having the vertical pipes *b* separate, as shown in Figs. 2, 4, and 5, they may be arranged in pairs with a fire-wall between them, as shown in Fig. 6, and the edges of the partitions *i* may also be protected by water-pipes, as shown in said Fig. 6.

The construction of the burners compels the air to enter the combustion-chamber in a thin sheet and to strike a similar sheet of gas at right angles, or nearly so, thus furnishing the best condition for combustion, initial heat, and penetrating surface contact.

As shown in Fig. 5, the gas-jets, which enter the combustion-chamber with some force, carry with them the air-jets, rendering escape from contact and union impossible, thus securing complete combustion in the chamber C, creating the greatest possible heat at once, reducing the space for combustion to a minimum, and increasing the absorption-space to a maximum, which is the best possible condition for economical and efficient working.

Constructing the burners in the manner described, several other advantages are gained. They will not clog, they are rendered indestructible by the heat, and in connection with steam-boilers add to their efficiency by considerably increasing the heating-surface.

The pipes *c* and *c'* are provided at each end with removable heads, and the one *c'* is also provided with a blow-off cock. (Not shown.)

I claim—

1. In a furnace adapted for burning gaseous fuel, a burner composed of a series of vertical and horizontally-arranged pipes, through which is maintained a circulation of water, and a series of partitions interposed between said vertical pipes, combined with suitable inlets for supplying a volume of gas and air to the burner, substantially as described, for the purpose specified.

2. In a furnace adapted for burning gaseous fuel, the combination, with the boilers B, of the horizontally-arranged pipes *c* and *c'* and vertical pipes *b*, the said pipe *c* connected with the steam and water spaces of the boiler by pipes *e* and *d*, respectively, and the vertical partitions *i*, arranged between the vertical pipes *b*, substantially as and for the purpose described.

3. In a furnace adapted for burning gaseous fuel, in combination with the horizontal pipe *c*, formed with the lug *o* along its front, the inclosing-plate *h*, formed with doors *f*, and lugs *l*, combined with the pipe *c'*, vertical pipes *b*, and fire-brick partitions *i*, substantially as and for the purpose described.

4. In a furnace having the absorption-chamber S and combustion-chamber C, the air-main A, formed at the rear of the furnace beneath the absorption-chamber, the series of narrow passages *a*, passing beneath the absorption and combustion chambers, and the gas-main G at the front of the furnace, having series of narrow inlets *g*, combined with a burner composed of a series of horizontal and vertically-arranged water-pipes, and fire-brick divisions or partitions, substantially as and for the purpose described.

5. A burner for furnaces adapted for burning gaseous fuel, composed of a horizontally-arranged pipe, a series of pipes connecting the horizontal pipe, and a series of divisions or abutments interposed between said vertical pipes to form narrow openings between the abutment ends and vertical pipes, substantially as and for the purpose described.

6. A burner for furnaces adapted for burning gaseous fuel, composed of a series of vertically-arranged pipes or deflectors, a series of abutments arranged to project between said vertical pipes or deflectors, a series of spaces formed between the vertical abutments or partitions, and a series of air-inlets communicating with the spaces between the abutments or partitions, combined with a gas-main at the front of the furnace communicating with every alternate flue-space, and an air-main beneath the rear of the absorption-chamber of the furnace, also communicating with every alternate flue-space, substantially as and for the purpose described.

7. The combination, with a combustion-chamber, of a series of separate burner-entrances for gaseous fuel, formed by and be-



tween water-protected pipes and abutments relatively arranged to direct streams of flame, gas, and air over and around their walls under pressure into the combustion-chamber.

5 8. The combination, with the main G, containing gas under pressure, of a system of water-protected pipes and wall-abutments arranged to form burner-orifices over and around said pipes, communicating with said main, 10 and independent air-supplying inlets communicating with said burner-orifices over and around said pipes.

9. The combination, with a system of separated water-protected pipes and vertical 15 abutments arranged at the front wall of the combustion-chamber to form burner-orifices over and around said pipes, of front doors, *f*, arranged to give access to the burner-orifices between said vertical abutments.

20 10. The combination, with a system of water-protected pipes, and wall-abutments arranged to form burner-orifices, and gas and air supplying mains communicating with said

burner-orifices, of ignition-chambers *a' g*, arranged between the said burner-orifices and 25 the said supply-mains, whereby the gas and air are caused to commingle in combustion and to pass in flame under pressure through the burner-orifices into the combustion-chamber. 30

11. The combination, with a furnace combustion-chamber and a system of pipes and abutments constructed and arranged to form burners for gaseous fuel, and one or more steam-boilers, of means for connecting said 35 burner-pipes with the boiler water-space, substantially as described, whereby to afford water-protection to said burner-pipes.

In testimony whereof I have hereunto set my hand in the presence of subscribing witnesses. 40

EDWARD A. UEHLING.

Witnesses:

E. W. ULMAN,  
J. D. PRANKLEY,  
J. DAVIS BRODHEAD.