No. 680,653. Patented Aug. 13, 1901.

G. S. GALLAGHER.

FURNACE.

(Application filed Jan. 21, 1901.)

(No Model.) 2 Sheets—Sheet 1.

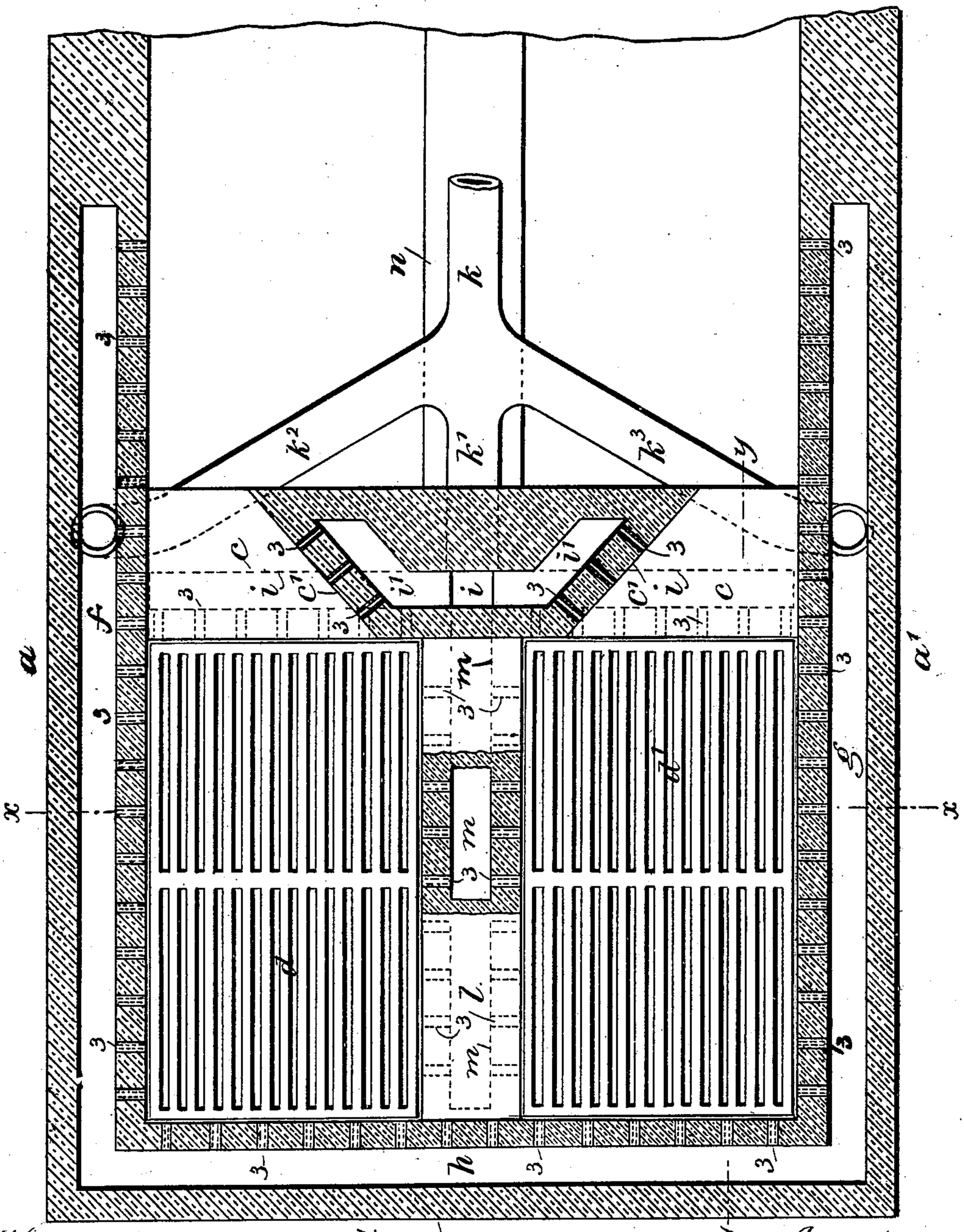

Fig. 1.

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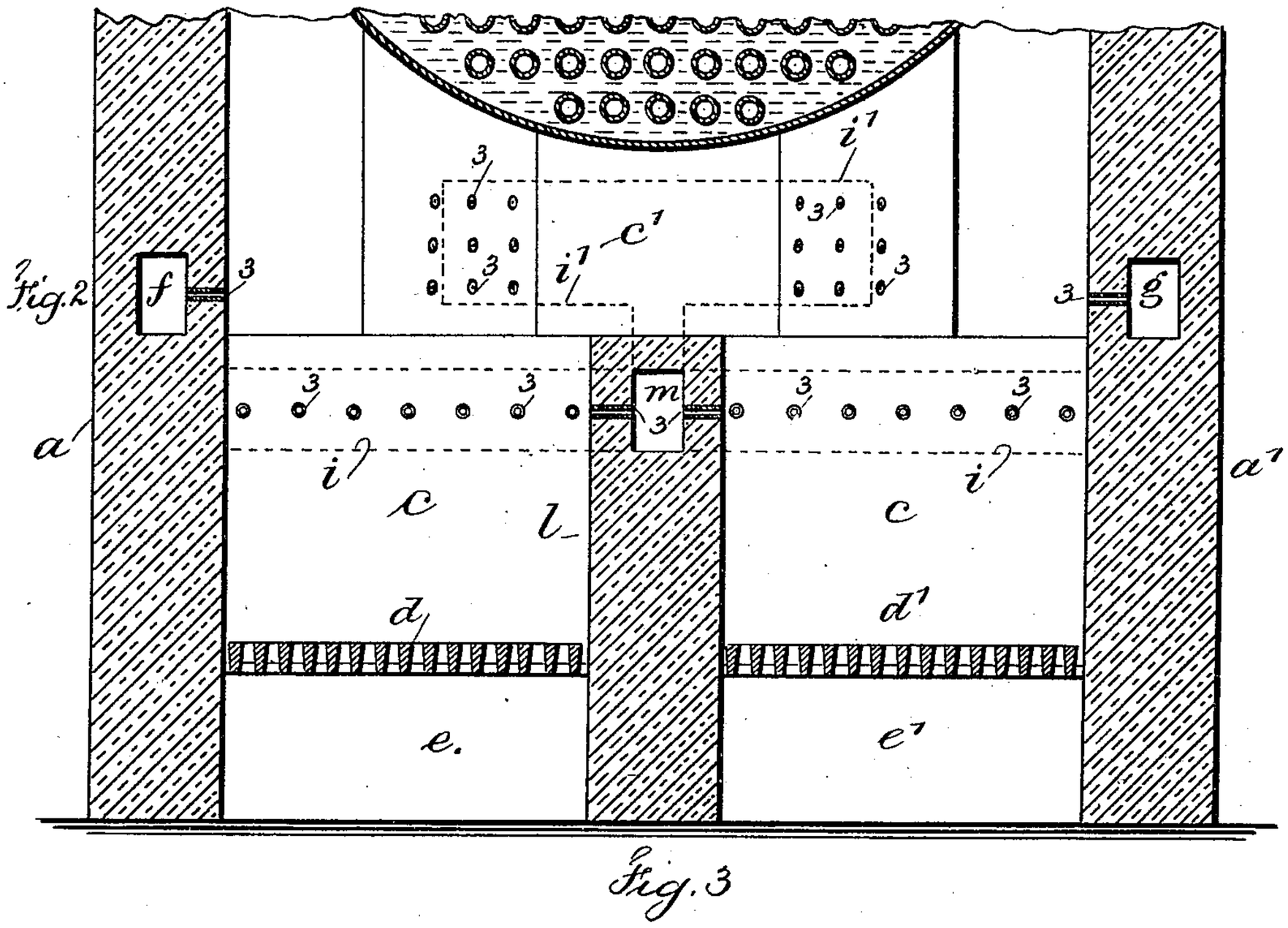
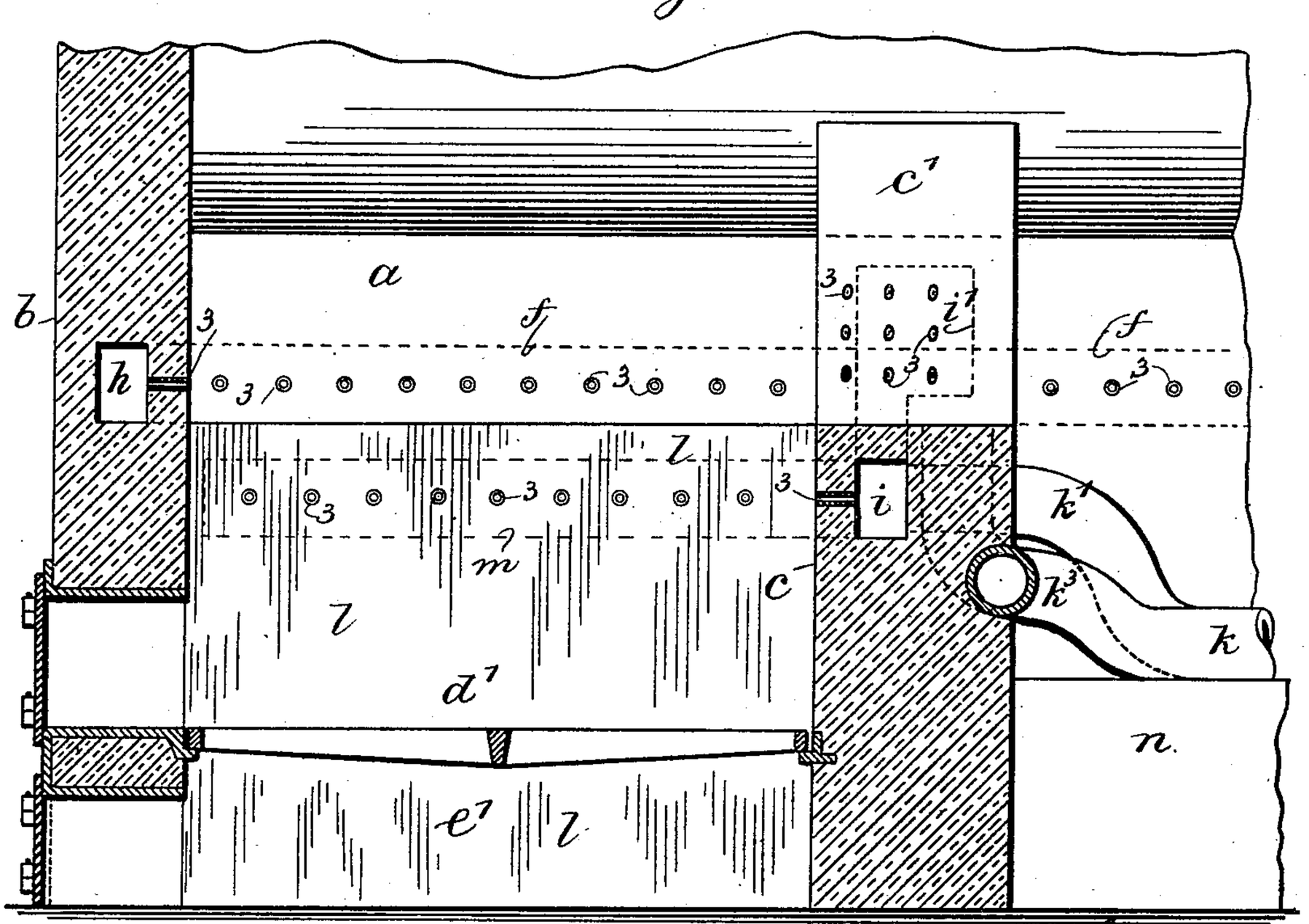


Fig. 3



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UNITED STATES PATENT OFFICE.

GEORGE S. GALLAGHER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO LEAVITT J. HUNT, OF SAME PLACE.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 680,653, dated August 13, 1901.

Application filed January 21, 1901. Serial No. 44,063. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. GALLAGHER, a citizen of the United States, residing at the city of New York, in the borough of Manhattan, county and State of New York, have invented an Improvement in Furnaces, of which the following is a specification.

My present invention relates particularly to steam-boiler furnaces and to devices for facilitating the consumption of smoke and gases for the production of perfect combustion, and the same is an improvement upon devices heretofore adopted and employed by me.

In instances where wide fuel-beds are employed under large or double boilers it is difficult for the air forced over the fire to spread with uniformity over the entire fire area to render the combustion as perfect as possible; and the object of my invention is to overcome this difficulty.

In carrying out my invention and in combination with flues and injector-pipes in the side walls at each side of the fire-chamber and in the side walls back of the bridge-wall and also in the front wall I employ one or more intermediate walls dividing up the fire or grate area, the said intermediate wall being parallel with the side walls and between the bridge and front walls with a flue longitudinally through such wall and injector-pipes in opposite sides of the wall connecting the flue and the combustion-chamber. I also divide the exit of the products of combustion passing above the bridge-wall by building up the center of the bridge-wall to the under side of the boiler and place therein flues and openings therefrom to the passage-ways thus formed between the side walls and said extension of the bridge-wall, and I prefer to build this extension of the bridge-wall of tapering form—that is to say, narrower at the side next to the fire-chamber and wider at the distant side—so that the passage-ways are contracted in the direction of movement of the products of combustion passing over the bridge-wall. In this manner any smoke or gases unconsumed in the combustion-chamber by the surplus of air have an additional quantity of air imparted in the passage-ways over the bridge-wall and back of the same with the view of making the combustion complete.

In the drawings, Figure 1 is a sectional plan representing my invention. Fig. 2 is a cross-section at $x\ x$ of Fig. 1, and Fig. 3 a longitudinal section at $y\ y$ of Fig. 1.

The side walls $a\ a'$ and front wall b are of usual character, and the bridge-wall c extends transversely of the furnace between the side walls, and $d\ d'$ represent grate-bars, and $e\ e'$ the ash-pits. The side walls $a\ a'$ are made with flues $f\ g$, extending from the front wall to back of the bridge-wall. The front wall is made with a flue h, connecting the forward ends of the flues f and g.

The bridge-wall c is made with a flue i, passing longitudinally within the same, and above the bridge-wall and extending therefrom to the under side of the boiler is the bridge-wall extension c', preferably of tapering form in the sectional plan Fig. 1—that is, the portion of the bridge-wall extension next to the grate-bars and combustion-chamber is narrower than the rear face at the back of the bridge-wall. In this way the passage-way over the bridge-wall and between the said extension and the side walls is narrowed in the direction of travel of the products of combustion, the contracted portion of said passage-way being at the rear edge of the bridge-wall.

In the bridge-wall extension c' there are one or more flues i', that connect with the flue i in the bridge-wall. Between the grate-bars and extending from the bridge-wall to the front wall I employ one or more center walls l, dividing the ash-pit, grates, and fire-chamber into substantially equal portions. In the drawings I have shown one center wall, with a flue m extending longitudinally through the wall and connecting with the flue i in the bridge-wall c.

I provide injector-nozzles 3 in the form of pipe-sections built into the side and front walls, the bridge-wall, the bridge-wall extension, and the center wall l, and which connect

the flues in said parts with the combustion-chamber. *k* represents the main air-pipe, preferably placed on top and along a central wall *n* back of the bridge-wall. The main air-pipe is preferably divided into three branches *k' k² k³*, the central branch *k'* extending to the flues *i i'* and *m* in the bridge-wall, the bridge-wall extension, and the center wall. The branch *k²* extends to the right and the branch *k³* to the left from the main pipe *k*, said branches *k² k³* passing to the side walls and opening into the flues *f* and *g*.

The main air-pipe *k* is exposed and upon the central wall *n* for the purpose of raising the temperature of the air moving through the pipe by the passing hot products of combustion, so that the air is highly heated before passing into the various flues in the walls of the furnace and passing from said flues through the injector-nozzles into the fire-chamber to commingle with the smoke and the gases to cause a perfect combustion in the fire-chamber and prevent the loss of the units of heat, so that the same may be as fully utilized as possible.

I do not herein limit myself to the tapering form in section of the bridge-wall extension and the consequent narrowing of the passage-ways between said extension and the side walls of the furnace, although I prefer to construct the parts in this manner, because the action is to retard the movement from the fire-chamber over the bridge-wall of the products of combustion and smoke, their sudden escape being prevented and the opportunity being present thereby to inject an abundance of air, which commingles therewith for the purpose of completing the combustion.

In my improvement should any smoke and unconsumed gases move rearward of the combustion-chamber over and back of the bridge-wall provision is made for forcing into the same air through the nozzles projecting from the flues *i'* in the bridge-wall extension and from the rear ends of the flues *f* and *g* in the side walls, with the object of preventing any smoke or unconsumed gases passing away from beneath the boiler and finally escaping unconsumed.

I claim as my invention—

1. The combination in a furnace adapted for the consumption of smoke and gases, with the side and front walls and the bridge-wall having flues and injector-nozzles connecting said flues with the combustion-chamber, of a center wall extending from the bridge-wall forward to the front wall, a bridge-wall extension extending centrally from the top of the bridge-wall up to the under side of the boiler, said central wall and bridge-wall extension having flues therein and injector-nozzles connecting the flues with the combustion-chamber and the passage-way between the side walls and the bridge-wall extension and rearward of the bridge-wall, and means substantially as shown and described, for supplying air under pressure to the said flues to be passed through the injector-nozzles into the combustion-chamber, substantially as and for the purposes set forth.

2. The combination in a furnace adapted for the consumption of smoke and gases, with the side and front walls, and the bridge-wall having flues and injector-nozzles connecting said flues with the combustion-chamber, of one or more walls extending from the bridge-wall to the front wall and intermediate to the side walls, an extension of the bridge-wall therefrom up to the boiler, said central or intermediate wall and the bridge-wall extension having flues and injector-nozzles connecting the same to the combustion-chamber, the bridge-wall extension being of tapering form narrowest next to the combustion-chamber along the front edge of the bridge-wall and widest along the rear edge of the bridge-wall distant from the combustion-chamber and in effect narrowing the passage-ways between the same and the side walls of the furnace, a main air-pipe, a wall along which the main air-pipe is supported exposed, branches from the main pipe to the said flues, whereby air under pressure is forced through the flues and the injector-nozzles into the combustion-chamber to commingle with the smoke and gases to form a perfect combustion, substantially as set forth.

3. The combination in a furnace adapted for the consumption of smoke and gases with the main side and front walls and the bridge-wall extending between the same and having flues and injector-nozzles connecting said flues with the combustion-chamber which they surround, of a center wall of similar character to the main and bridge walls and extending from the bridge-wall forward to the front wall and dividing both the fire-chamber and ash-pit and having a flue longitudinally of the same opening from and agreeing substantially in height with the flue of the bridge-wall, and injector-nozzles in the center wall connecting the flue therein with the portions of the divided combustion-chamber on each side of said center wall, substantially as and for the purposes set forth.

4. The combination in a furnace adapted for the consumption of smoke and gases with the side and front walls and the bridge-wall having flues and injector-nozzles and connecting said flues with the combustion-chamber which they surround, of a bridge-wall extension extending centrally from the top of the bridge-wall up to the under side of the boiler, the said bridge-wall extension being of tapering form narrowest next to the combustion-chamber along the front edge of the bridge-wall and widest along the rear edge of the bridge-wall distant from the combus-

tion-chamber and in effect narrowing the passage-ways between the same and the side walls of the furnace, the said bridge-wall extension having flues therein and injector-nozzles connecting the flues upon the opposite tapering sides of the said extension with the combustion-chamber and the passage-ways between the side walls and the bridge-wall extension, substantially as and for the purposes set forth.

Signed by me this 16th day of January, 1901.

GEORGE S. GALLAGHER.

Witnesses:
GEO. T. PINCKNEY,
S. T. HAVILAND.