

E. FAIR.
BOILER FURNACE.

No. 188,733.

Patented March 27, 1877.

FIG. 1.

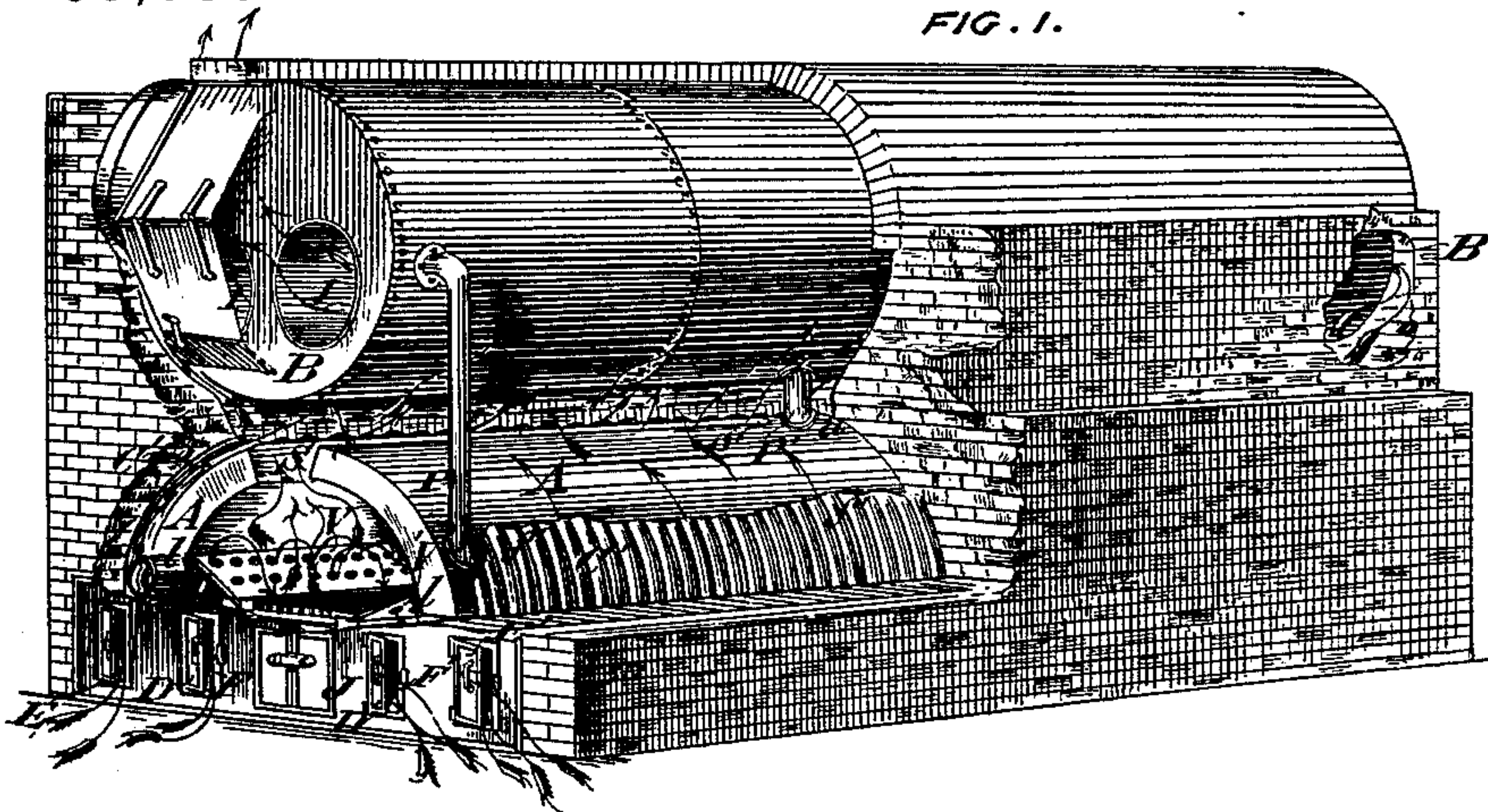


FIG. 2.

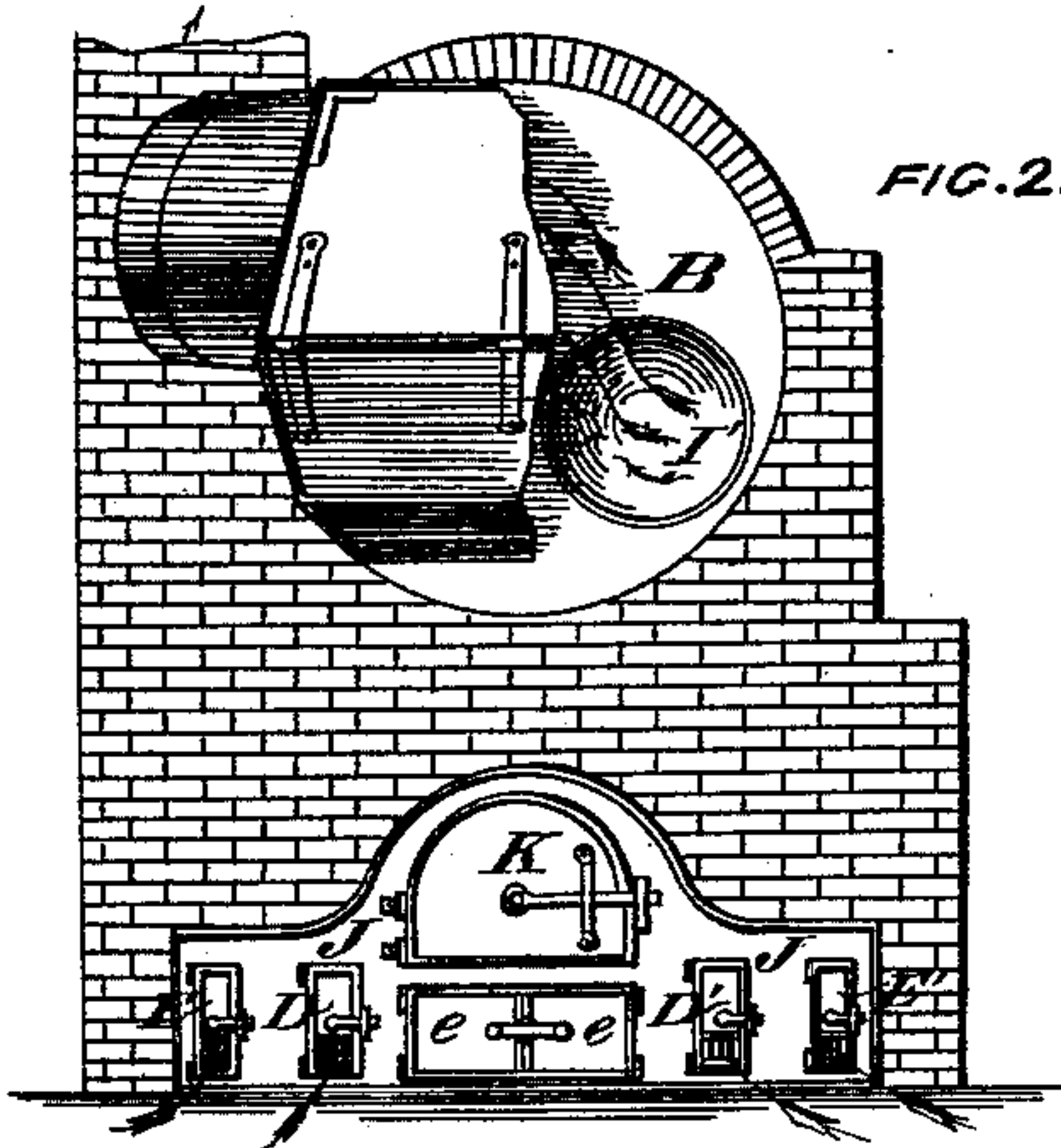


FIG. 3.

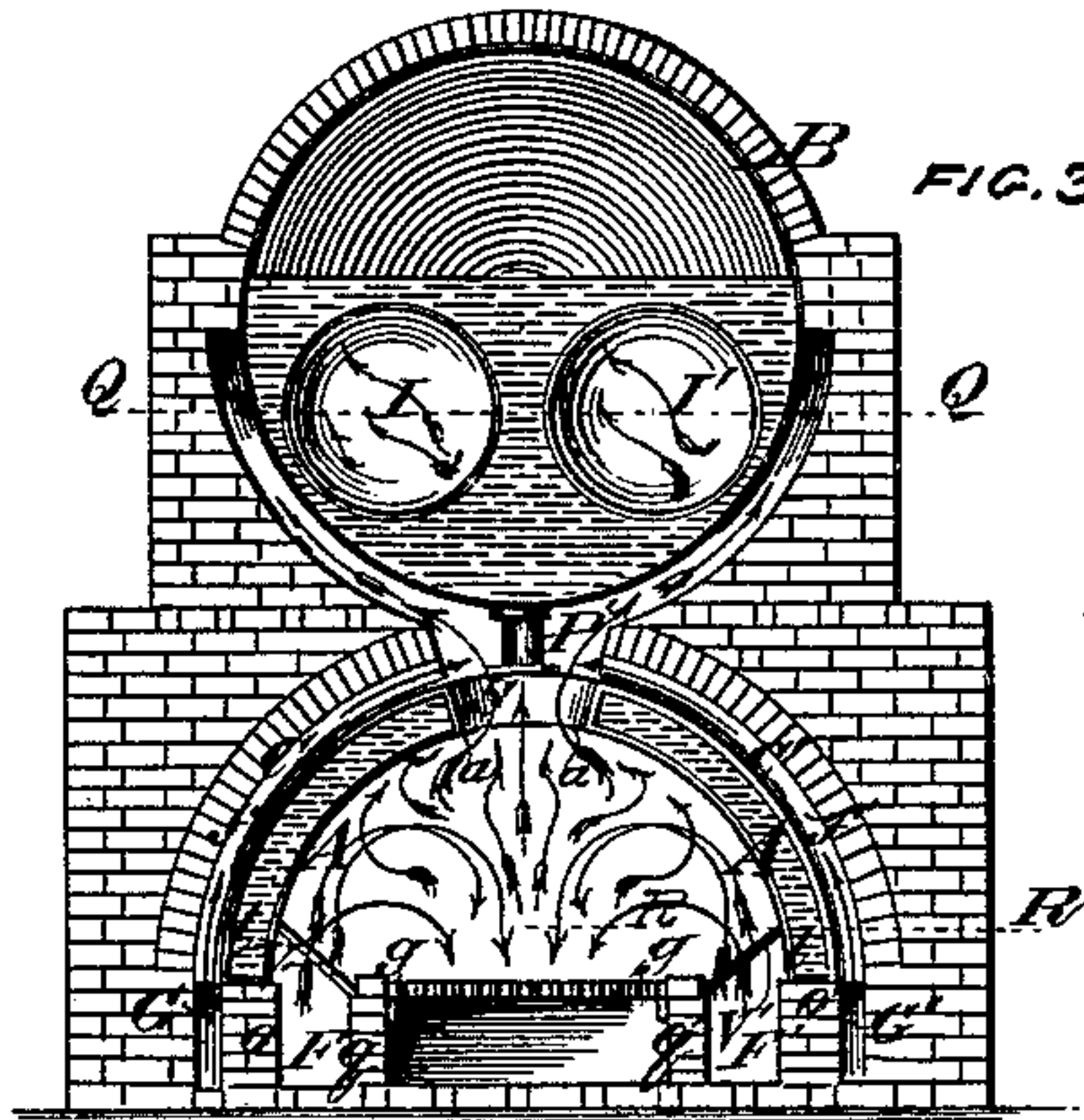
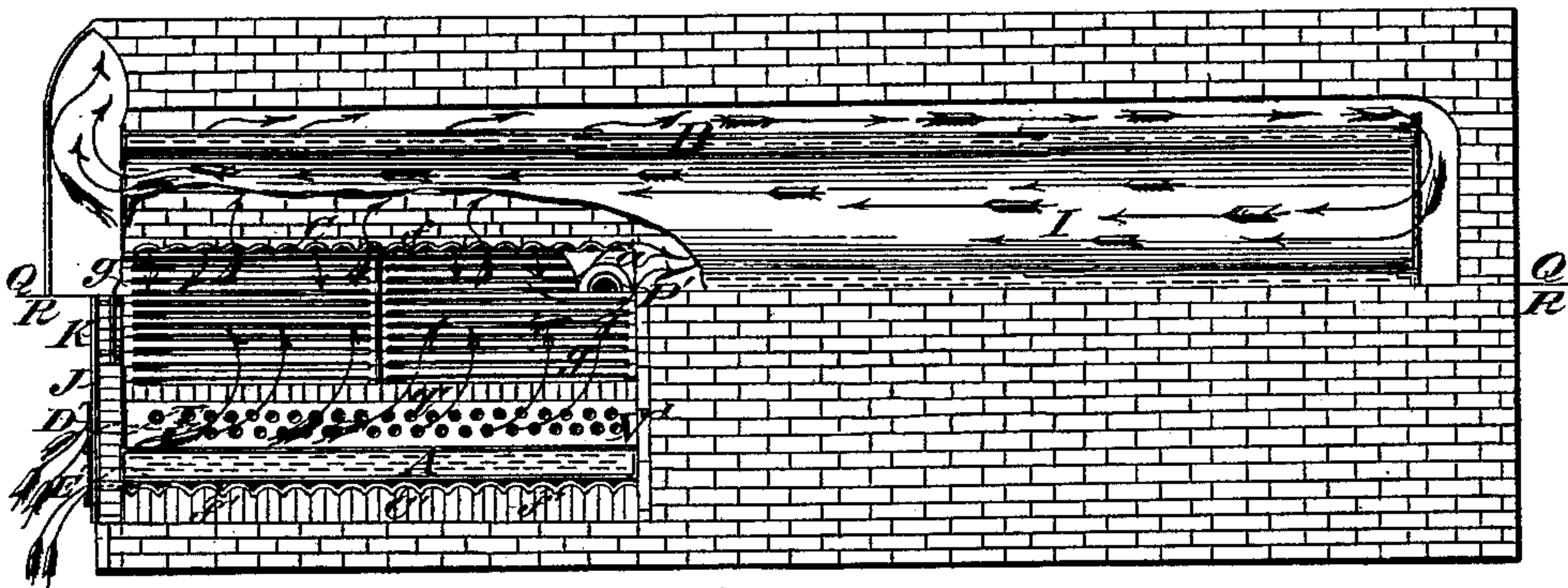


FIG. 4.



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IMPROVEMENT IN BOILER-FURNACES.

Specification forming part of Letters Patent No. 188,733, dated March 27, 1877; application filed September 23, 1876.

To all whom it may concern:

Be it known that I, EDWARD FAIR, of the city and county of San Francisco, State of California, have invented certain Improvements in Furnaces for Heating Boilers, &c., designated by me as a "Combined Furnace and Water-Heater," of which the following is a specification:

My invention consists, essentially, of an arched water tank or heater communicating with any form of boiler, and provided with an opening or slot at the top, extending nearly its entire length, said arch forming the roof of a furnace wherein air is admitted to the fuel for combustion purposes by flues that carry it through perforated plates or their equivalents placed lengthwise within this arch, one on each side of the grate, and constructed in such manner that the air thus introduced may be made to fall onto the fuel instead of under, and into it through the grate-openings thereby entirely dispensing with these grate-openings for the admission of air. The flame from this fuel under combustion is thus made to rush through the top opening or slot, and is there again fed by several streams of additional air brought through another set of flues formed by corrugated metallic backings fitted to the outer shell of this arched heater; and, lastly, this flame is made to pass under and through the connected boiler to the chimney, so as, on its way, to heat still further the water therein contained.

By this arrangement I claim that the flame is made more intense by its temporary confinement within this arched chamber by reason of the nearly complete combustion of the inflammable gases therein, as also from the reflected heat produced in the same due to the shape of this water-heater arch; also, that those gases not completely consumed are entirely disposed of by the separated air-jets introduced onto the flame by these corrugated metallic flues after the manner of an ordinary oil-lamp burner now in general use, while at the same time, by such complete combustion, sparks are prevented from rising to the boiler-chimney; lastly, by reason of the combustion of these gases on this principle, I claim a greater heating capacity to the water contained in the boiler connected to this heater for an equal

amount of fuel used, since the flame, on receiving its last supply of air, and in its most intense form, may be introduced still farther under and through such boiler by flues provided and constructed in such form as may be most desirable.

Figure 1 is a perspective view of the combined gas, smoke, and spark consuming furnace and water-heater embodying my invention, wherein portions are broken away to show the interior details. Fig. 2 is a front vertical elevation of the same. Fig. 3 is a vertical transverse section of this combined furnace and water-heater. Fig. 4 is a plan of Fig. 3, wherein the upper half represents a section through the line Q Q, and the lower half through the line R R.

With reference to the drawing, A A is the arched tank or water-heater, connected to an ordinary flue-boiler, B B, by pipes P P', in such manner that when heat is applied to this arched heater A A a continuous circulation of the contained water within this boiler and tank may be insured. S S is the slot or opening provided on the top of this arched tank A A, leaving a connection, *a a*, between the legs *l l* thereof. Each of these legs *l l* rests on a wall, *o o'*, built the entire length thereof, while the front arched opening is faced by a furnace-door and flue-plate, J J, and the rear is bricked up. Within the chamber thus formed a grate, *g g*, is fitted onto walls *q q'*, so as to leave an ash-pit beneath and spaces for flues between the walls *o o'*, supporting the legs *l l* and these fire-grate walls. A door, D, on each side of the ash-pit doors in the plate J J, admits air to this flue-space F F' thus made, and each such flue is covered over by a perforated metallic plate inclined at a considerable angle to the grate *g g*, so that jets of air may be thrown to both the top and sides of the burning fuel, and as much as possible equally distributed over it. On the outer shell of each leg of this water-heater a metallic backing, C C', corrugated so as to form numerous air-flues *f f'*, is fitted, and these flues are so constructed as to terminate at the slot-opening S S, and receive this additional air-supply from chambers extending the entire length of the tank, from doors E E' placed one on each side of the first set of flue-doors D D'. J J, the furnace-door

plate, in addition to the furnace and flue doors named, is provided with ash-pit doors *e e*, which are only opened for the purpose of clearing the ash-pit, as the entire supply of air for combustion purposes is introduced through these doors *D D' E E'* to their respective flue-chambers *F F' G G'*.

The operation of this combined gas and smoke consuming furnace and water-heater is as follows: On fuel being introduced through the furnace-door *K* onto the grate *g g*, and combustion induced in the usual manner, this furnace-door *K* and these ash-pit doors *e e* are then closed, and the flue-doors *D D' E E'* are either partially or entirely opened, as may be required. By this action the air from the flues *F F'* is immediately drawn through the perforated plates over onto the flame in the grate *g g*, and the combustion of the inflammable gases is there rendered nearly perfect by being thrown back again onto the incandescent fuel by being temporarily confined in this arched heater before escaping through the opening *S S*, while the reflected heat of the inner shell of this tank *A A* still further helps to effect the object in view. By this means a strong current is produced through this opening *S S*, and the flame at this point is attacked by these several jets of fresh air on both sides at the same time, which air has already been heated by contact with the outer shell of the water-heater during its passage through the corrugated flues *f f'*.

This last device is supposed to effectually complete the combustion of the inflammable

gases arising from the reduction of the fuel within the grate, and the flame may then be conducted so as to spread in a sheet on each side of the boiler *B B* on its way to the return flues *I I*, and pass out toward the chimney, allowing of the passage of incombustible matter free of any material in a burning condition, such as sparks, as such are left or are disposed of in the furnace described.

I claim as my invention—

1. The combined furnace and water-heater described, consisting of the inclosed arched heater *A A*, provided with top opening *S S*, and communicating with a boiler, *B B*, by pipes *P P'*, the air-flues *F F'*, provided with perforated plates *V V'*, constructed and arranged to the grate *g g*, as shown, and the combustion jet-flues *C C' f f'*, all for the purposes herein set forth and specified.

2. The combination, substantially as specified, of the grate and the air passages or flues *F F'*, which are covered with perforated plates, inclined, as shown, so as to direct converging jets of air into the combustion-chamber.

3. The corrugated metallic flue-backings *C C'*, fitted to the outer shell of the tank *A A*, and flue-chambers *G G'*, arranged as shown, in combination with the furnace-opening *S S* of the arched heater *A A*, substantially as and for the purposes herein set forth and specified.

EDWARD FAIR.

Witnesses:

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