(No Model.)

3 Sheets—Sheet 1.

S. T. OWENS.

FURNACE FOR STEAM BOILERS.

No. 330,147. Patented Nov. 10, 1885.

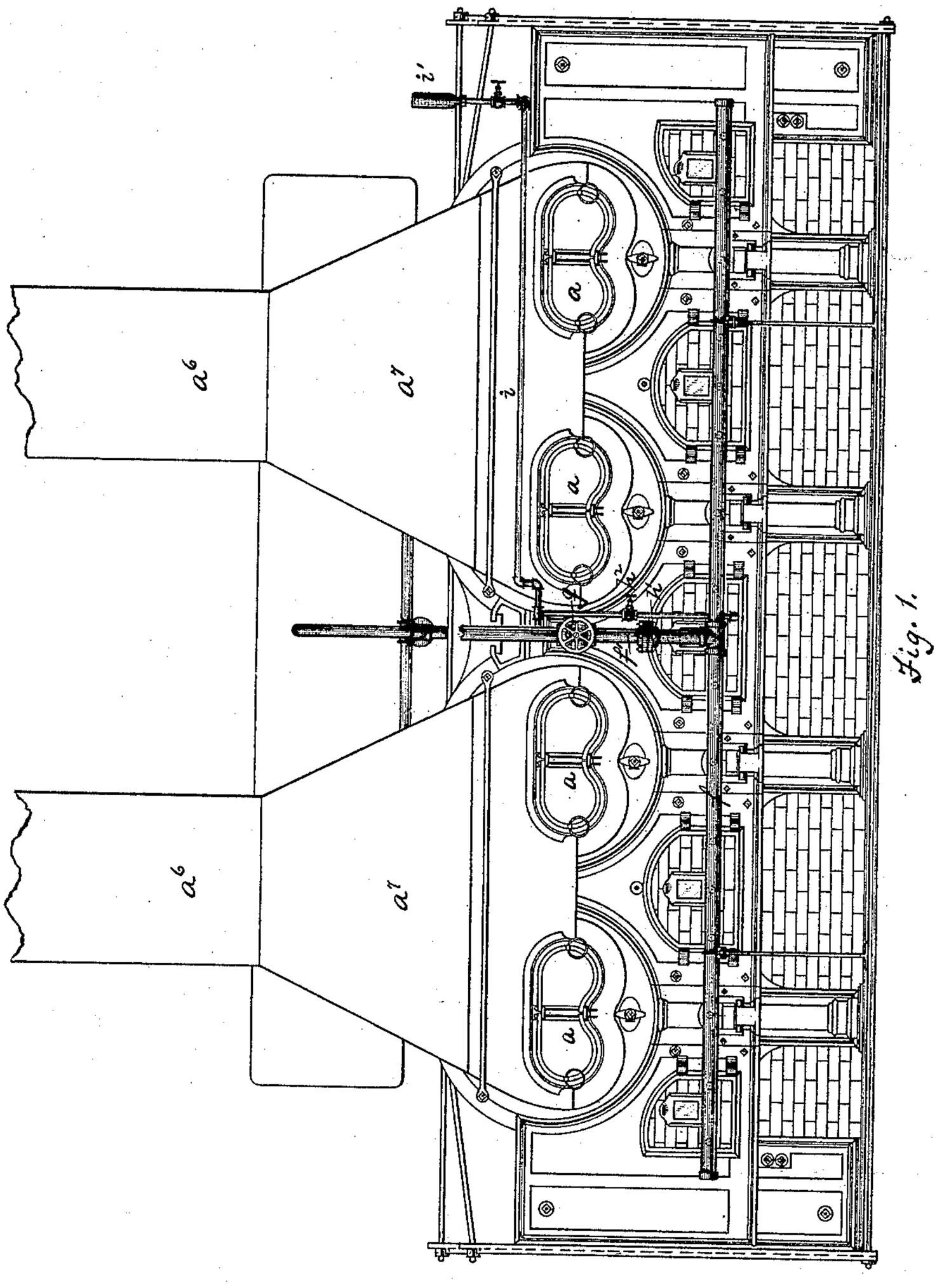

Fig. 1.

Witnesses.
H. C. G. Fanomann.
Alex. Scott

Inventor:
Samuel T. Owens
by his attys.
Bakewell & Kerr

(No Model.) 3 Sheets—Sheet 2.

S. T. OWENS.

FURNACE FOR STEAM BOILERS.

No. 330,147. Patented Nov. 10, 1885.

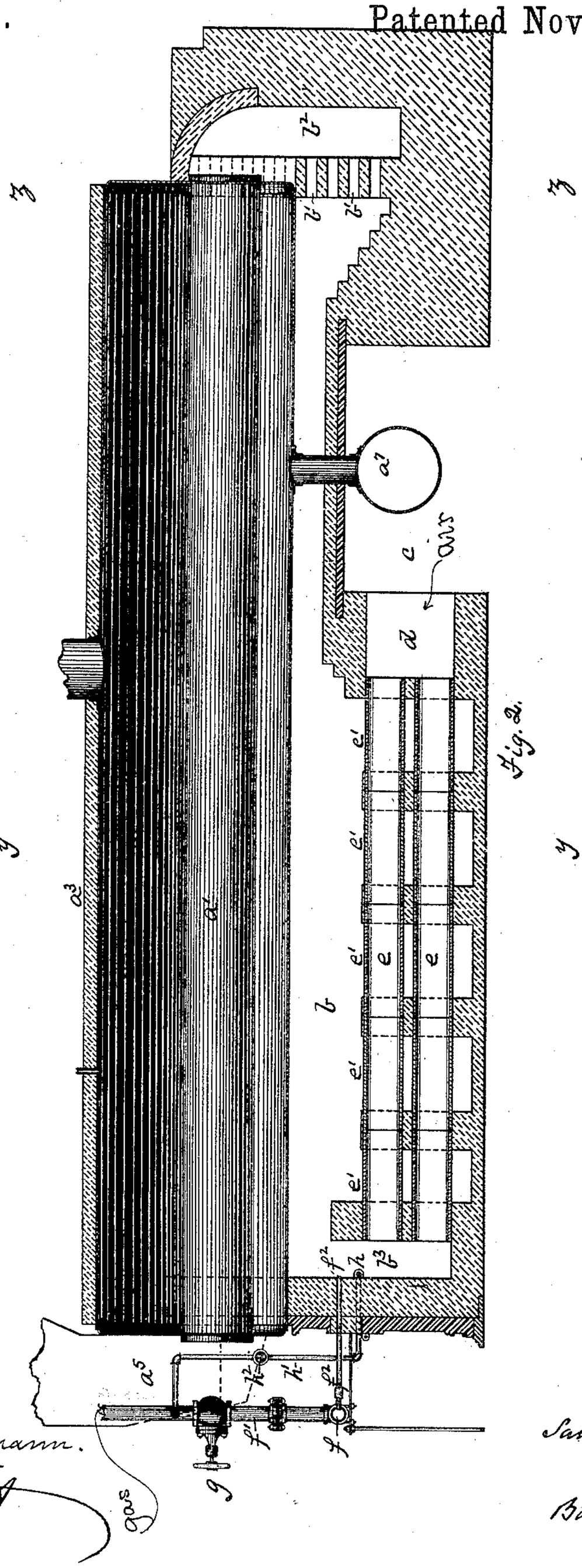

Fig. 2.

Witnesses.

H. C. Hansmann.

Alex. Scott

Inventor.

Samuel T. Owens

by his attys

Bakewell & Kerr

(No Model.)

3 Sheets—Sheet 3.

S. T. OWENS.

FURNACE FOR STEAM BOILERS.

No. 330,147. Patented Nov. 10, 1885.

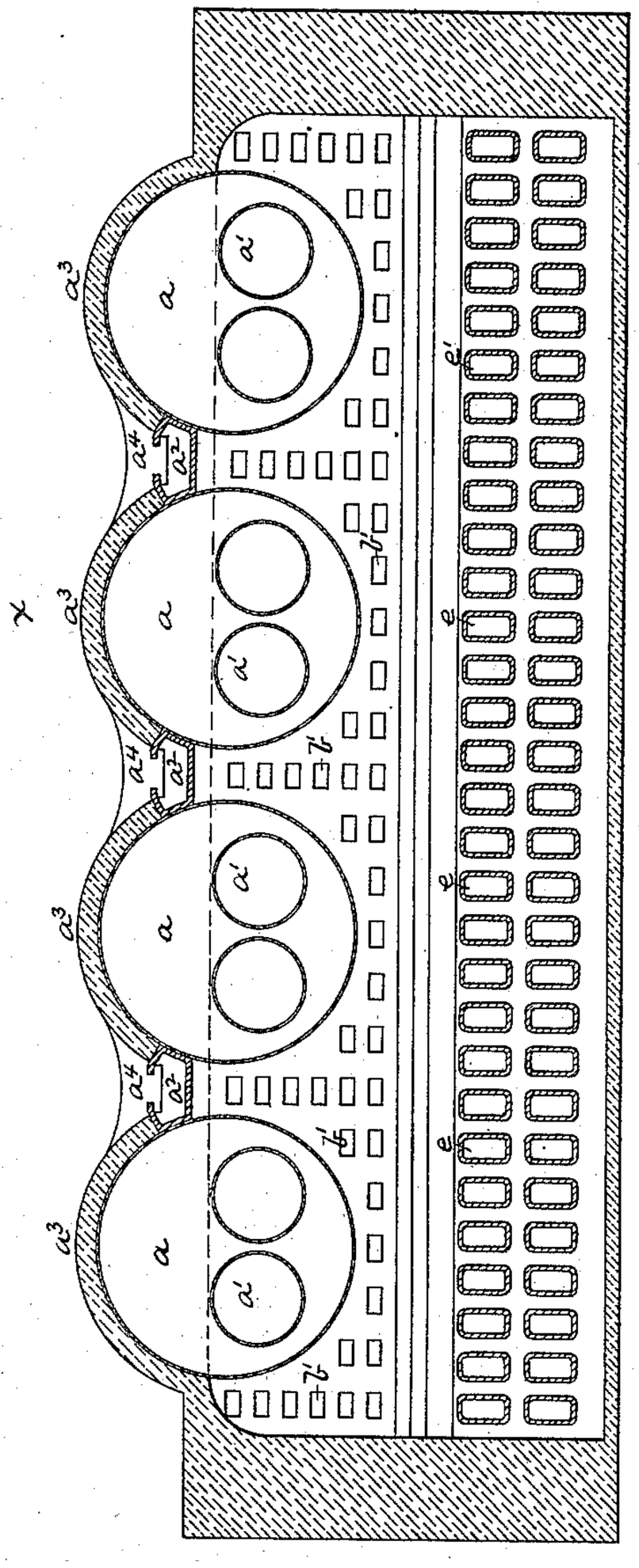

Fig. 3.

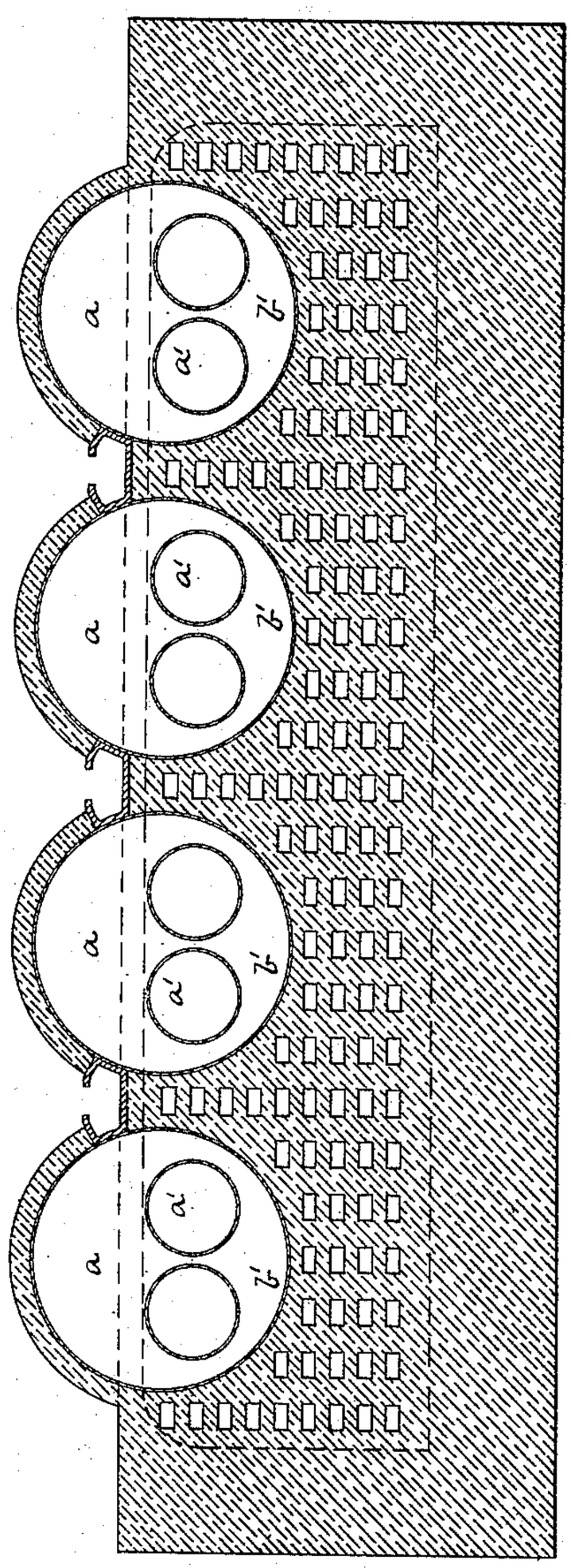

Fig. 4.

Witnesses.

H. E. Fassmann.

Alex. Scott

Inventor.

Samuel T. Owens,

by his attys

Bakewell & Kerr

UNITED STATES PATENT OFFICE.

SAMUEL T. OWENS, OF PITTSBURG, PENNSYLVANIA.

FURNACE FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 330,147, dated November 10, 1885.

Application filed November 19, 1884. Serial No. 148,310. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL T. OWENS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Furnaces for Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description thereof.

My improved furnace is specially adapted for use with natural gas; but it is also applicable, by the addition and proper arrangement therewith of an ordinary gas-producer, to use with manufactured gas.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying drawings, in which—

Figure 1 is a front elevation of my improved furnace applied to a battery of boilers. Fig. 2 is a longitudinal vertical section through one of the boilers on the line *x x*, Fig. 3. Figs. 3 and 4 are vertical cross-sections of the battery on the lines *y y* and *z z* of Fig. 2, respectively.

Like letters of reference indicate like parts in each.

The battery consists of four cylindrical boilers, *a*, which are built in and sustained by suitable brick end and side walls, and are provided with the usual flues, *a'*. Between the boilers are metallic beams a^2, instead of the usual brick-work, and the covering a^3 is built up from these beams over the tops of the boilers, said covering being supported at its edges by the beams, which are preferably provided with supporting-flanges for that purpose. The beams a^2 separate the boilers and brace the inner sides of the outer boilers and both sides of the two inner ones. The boilers are further supported by metallic cross-braces a^4 placed at intervals along their length. The front ends of the flues *a'* communicate with the skirts a^5 of the stacks a^6 in the usual way. The combustion-chamber *b* extends under the entire length of the boilers and up between them to the beams a^2, and at the rear end it communicates by openings *b'* in the end wall with a transverse chamber or vertical passage, b^2, which in turn communicates with the rear ends of the flues *a'*, so that the flame and products of combustion from the chamber *b* pass through the openings *b'* and passage b^2 to the boiler-flues *a'*, and thence through such flues to the stacks. Near the rear end of the furnace is a cave or opening, *c*, which extends transversely, and in this cave the mud-drum a^7 of the boilers is situated. In the forward wall of the cave *c* is a large opening, *d*, from which one, two, or more rows of pipes or tubes, *e*, of refractory material extend forward and open into a vertical chamber or passage, b^3, at the front end of the combustion-chamber. The tubes *e* are composed of sections *e'*, and are supported at the joints by brick piers e^2, so that except where the piers occur there are open spaces around them, constituting part of the combustion-chamber, the flame and heat of which circulate freely through such spaces. These tubes admit air to support the combustion of the gas in the furnace, and are arranged, as described, in the combustion-chamber so that the air which enters cold through the opening *d* is delivered into the passage b^3 in a highly-heated condition. Extending horizontally along the front of the furnace is a gas-pipe, *f*, which receives its supply of gas from the pipe *f'*, and distributes it properly to the furnace by means of branch pipes f^2, which extend through front wall and discharge into the combustion-chamber at suitable intervals at or near the upper end of the passage b^3. The supply of gas is controlled by a valve, *g*, in the pipe *f'*. Extending along the inner side of the front wall, below the mouths of the pipes f^2, is a small perforated pipe, *h*, which is connected by a small pipe, *h'*, with the gas-supply pipe *f'* above the valve *g*, so as to be unaffected by the said valve. It is provided with an independent regulating-valve, h^2.

The purpose of the perforated pipe *h* is to keep a small flame constantly burning in the furnace, so that when the gas is turned on in the main pipe *f* it shall be instantly ignited, and the danger of explosions by reason of the collection of a volume of gas in the chamber *b* be greatly lessened. A further purpose is to keep sufficient heat under the boilers at all times to obviate all danger of their freezing in cold weather.

If desired, a burner, *i'*, Fig. 1, supplied with gas from the main *f'* by a pipe, *i*, may be provided for lighting the boiler-room.

Thus constructed and arranged the opera-

tion of my improved furnace is as follows, viz: The gas is turned on and ignited as it enters the chamber *b*. The air which supports the combustion enters from the cave *c* through the opening *d* and tubes *e*. At first, the tubes *e* being cold, the air is at the natural temperature, but the tubes *e*, being exposed to the heat of the furnace, soon become very hot, and the air is highly heated in its passage through them, and meeting the gas from the pipes f^2 in that condition effects its perfect combustion.

Practical experience has demonstrated that the best results with natural gas are obtained by supplying it cold, and the air in a highly or superheated condition. The higher the temperature of the air the better. This condition has been best attained by the use of checker-work regenerators, or hot-blast stoves; but these structures are of too expensive a character to be applied to ordinary boiler-furnaces. Attempts have been made to accomplish the same result without such expense by bringing the air in through passages formed in the walls or bottoms of furnaces of various forms; but such attempts have been attended with indifferent success, not one of them approaching in any efficient degree the results obtained by the use of regenerators. On the other hand, my improved furnace not only gives a temperature to the air which for all practical purposes is as efficient as that produced by a regenerator, but also brings the gas to the point of combustion in a cold state.

The back wall of the combustion-chamber *b*, with its openings *b'*, constitutes an important feature, as it acts as a break to the flame and intercepts and throws back into the chamber a large quantity of the heat. It also affords a means of regulating or adjusting the draft of the furnace.

No two furnaces are exactly alike, and better results may in many cases be obtained by changing the size of the throat. This can be accomplished with ease in my furnace by simply placing bricks in a sufficient number of the openings *b'*. When once the proper relative areas of throat and stack are obtained, the operation of the furnace can be regulated by the manipulation of the valve *g*.

Practical use of my improved furnace has demonstrated it to be of the greatest efficiency in the burning of natural gas. It effects its perfect combustion, and consequently is most economical. It is cheap in construction, and may without great expense be applied to existing furnaces. It is applicable to other uses.

I am aware that it is not new to pass air for supporting combustion through tubes or pipes heated by a furnace for the purpose of heating the air before it is lead to the combustion-chamber. I am also aware that perforated bridge-walls and checker-work are not new in furnaces.

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

1. In a boiler or similar furnace, the combination of the transverse cave or opening *c*, refractory pipes or tubes *e*, situate in the combustion-chamber *b* and communicating with the cave *c* and extending forward and opening into the vertical passage b^3, the upper end of which opens into the combustion-chamber *b*, substantially as and for the purpose specified.

2. The combination of air-heating refractory pipes situate in the combustion-chamber and communicating at one end with a transverse open air-passage, and at the other end with a vertical passage which leads up into the combustion-chamber, with gas-distributing pipes which enter through the front wall and discharge at or near the upper end of the said vertical passage, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 17th day of November, A. D. 1884.

SAMUEL T. OWENS.

Witnesses:
W. B. CORWIN,
JNO. K. SMITH.