

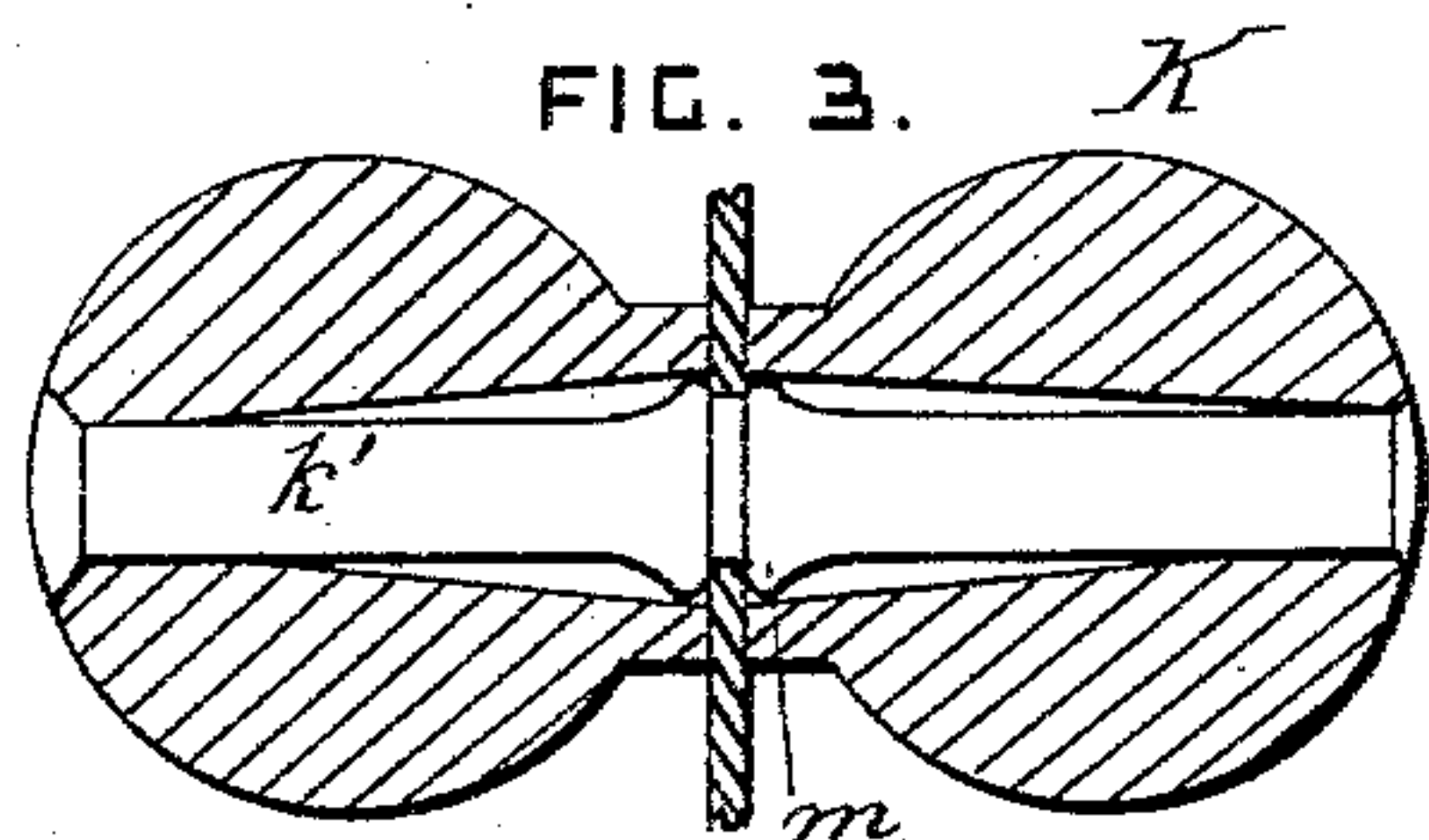
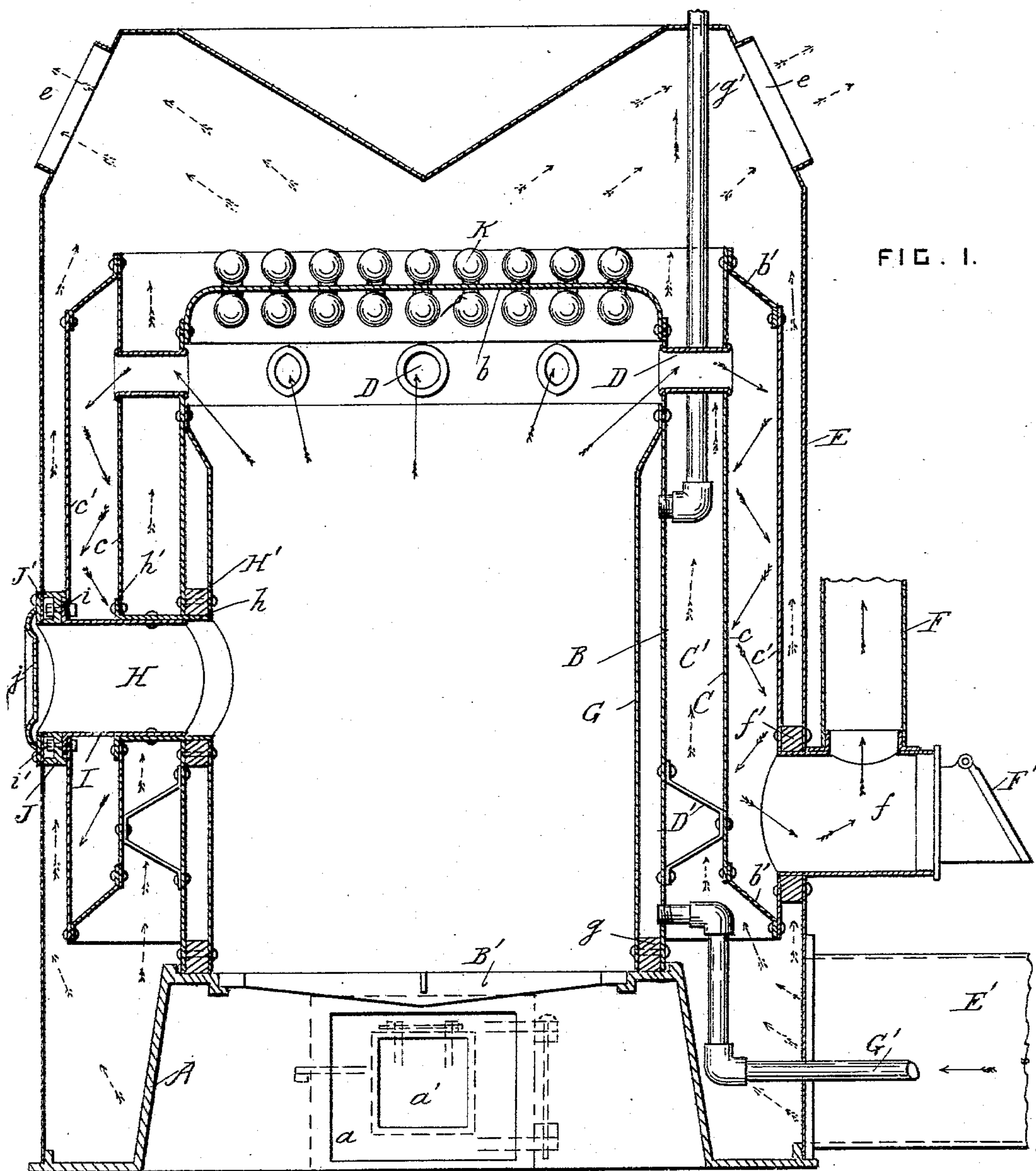
(No Model.)

2 Sheets—Sheet 1.

J. H. READER.
HEATING FURNACE.

No. 556,899.

Patented Mar. 24, 1896.



Witnesses

Walter Allen
J. H. Reader

Inventor

James H. Reader.

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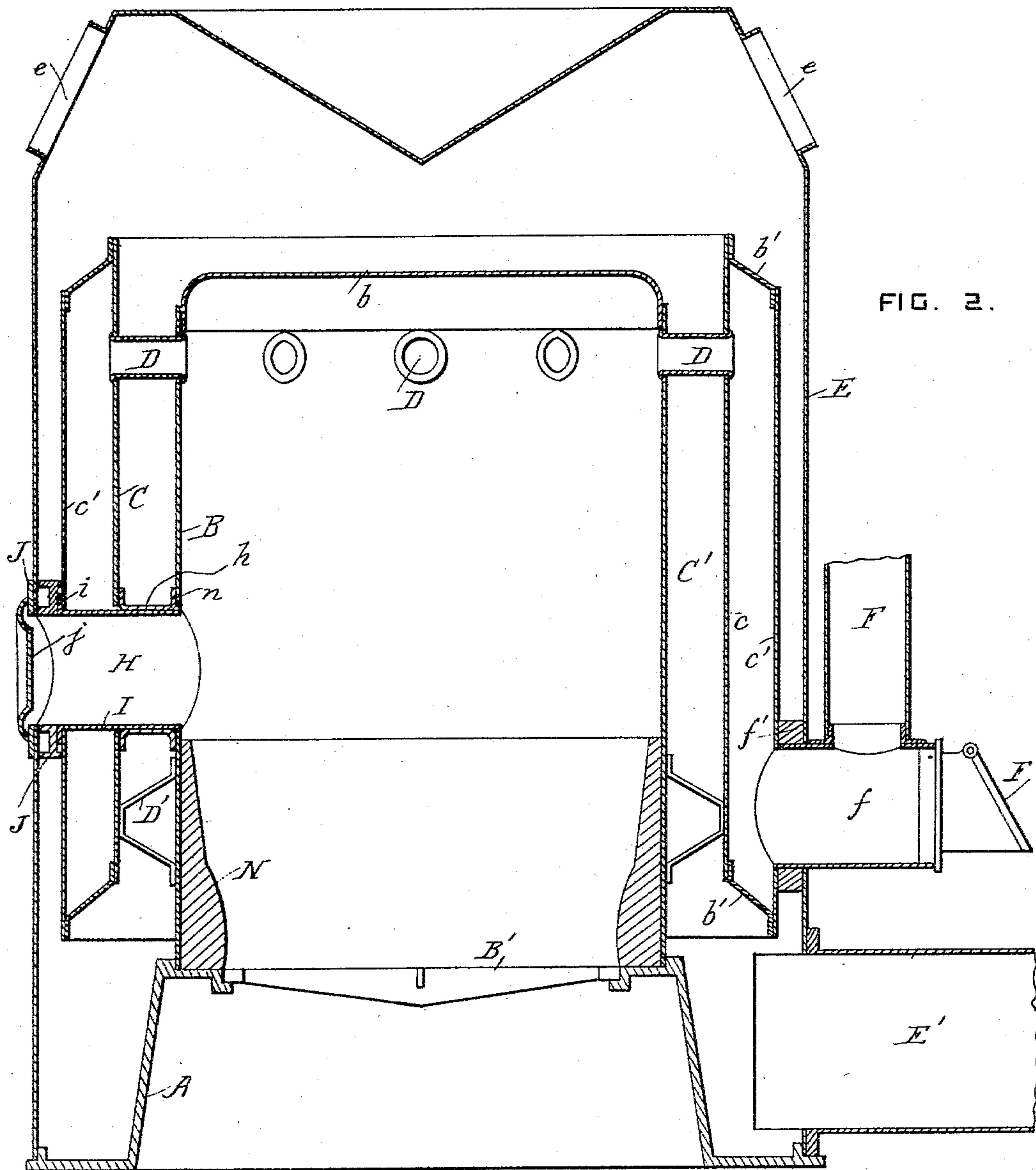
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UNITED STATES PATENT OFFICE.

JAMES H. READER, OF TYRONE, PENNSYLVANIA.

HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 556,899, dated March 24, 1896.

Application filed August 30, 1895. Serial No. 560,996. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. READER, a citizen of the United States, residing at Tyrone, in the county of Blair and State of Pennsylvania, have invented certain new and useful Improvements in Heating-Furnaces; 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.

This invention relates to furnaces for heating buildings; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings, Figure 1 is a vertical section through a furnace constructed according to this invention. Fig. 2 is a similar view to Fig. 1, but shows a modification of the furnace. Fig. 3 is a longitudinal section through a heat-transmitter drawn to a larger scale.

A is the hollow base portion of the furnace, forming an ash-chamber and provided with an ash-door *a* and a draft-door *a'* of approved construction.

B is the barrel or fire-box of the furnace, supported by the base A and provided with a dished crown-plate *b*. B' is a grate supported by the base A at the lower end of the barrel and of any approved construction.

C is an annular chamber surrounding the barrel B and leaving an air-space C' between the said barrel and chamber. The chamber C is composed of an inner shell, *c*, an outer shell, *c'*, and two flanged rings *b'* riveted to the two shells at the top and bottom of the chamber, respectively.

The chamber C is connected to the barrel B by a series of short tubes D, arranged as close as possible under the crown-plate. These tubes are preferably secured in place by an expander, and they have their edges beaded over according to any approved method of securing boiler fire-tubes.

The chamber C is supported from the barrel B by brackets D', and the tubes D also assist in keeping it in position.

E is an outer inclosing case secured to the lower part of the base A, surrounding the ash-chamber, extending above the top of the crown-plate, and leaving an air-space around the chamber C.

E' is the cold-air-inlet duct connected to the lower part of the case E, and *e* are the outlets for hot air at the top of the case.

F is a smoke-stack secured to a branch *f*, which is connected to the lower part of the chamber C. A ring *f'* is secured to the shell *c'* and to the case E around the branch *f*, and F' is a check-damper of approved construction carried by the said branch.

G is a water-jacket surrounding the fire-space inside the barrel B. The lower end of this jacket is riveted to the barrel, a ring *g* being interposed between the said parts, and the upper end of the jacket is preferably flanged outward and riveted direct to the barrel.

G' is the inlet-pipe for cold water, secured to the barrel and connected to the water-space at the lower part of the jacket, and *g'* is the outlet-pipe for the hot water, secured to the barrel and connected to the water-space at the upper part of the jacket.

The jacket may merely extend to the top of the fire-space in the barrel, or it may be continued up as far as desired in the barrel. The drawing Fig. 1 shows the water-jacket continued up as high as possible and secured to the barrel close under the tubes D.

H is the fuel-opening. H' is a ring riveted to the jacket and to the barrel around the said fuel-opening. A tube *h* is forced within the ring H' and is provided with a flange *h'* which is secured to the shell *c*. A second tube I is forced into the tube *h* and is secured to it. The tube I is provided with a flange *i* which is secured to the outer shell *c'*.

J is a ring interposed between the shell *c'* and the outer case E. The bolts or rivets *i'* which secure the flange *i* to the shell *c'* preferably pass through the said ring J and hold it in place.

J' is the frame of the fire-door, secured to the ring J and clamping a portion of the casing E between it and the said ring. The fire-door *j* is of any approved construction and is supported by the frame J'.

The fuel is supplied through the fire-door and opening H as often as necessary. The fuel which burns on the grate is kept from contact with the barrel by the water-jacket, and the products of combustion pass upward in the barrel, through the tubes D, into the annular chamber C. The products of combustion which issue from the tubes D strike the outer shell *c'* and pass downward and are deflected from shell to shell, as indicated by the arrows in the drawings. The products of

combustion pass from the lower part of the chamber C up the smoke-stack F, having parted with nearly all their heat before entering it.

5 The water-jacket which surrounds the burning fuel prevents the barrel from being heated to a higher temperature than the chamber C, and the inner and outer shells of the chamber C are heated to substantially
10 the same temperature. All the heating-surfaces of the furnace are maintained at substantially equal temperatures, and the expansion is therefore uniform, and the joints do not become leaky and permit the products
15 of combustion to pass into the air-spaces.

The cold air enters by the duct E' and passes upward in the direction of the dotted arrows between the barrel B and the chamber C and between the chamber C and the outer
20 case E. The hot air passes out by the outlets e and is conducted to various parts of the building by pipes in the usual manner.

As all the heating-surfaces are heated to a substantially uniform and comparatively low
25 temperature, a large body of air is heated uniformly without any portions of it being overheated, and the bad effects of burned dust in the hot air are avoided.

The hot water is conducted to various parts
30 of the building to which the hot air cannot conveniently be taken, and its supply in connection with hot air is found to be a very important auxiliary in the effective heating of all parts of a large building.

35 In order to increase the effectiveness of the crown-plate and other heating-surfaces, heat-transmitters K are used. These heat-transmitters consist of metallic balls or their equivalents, such as disks or plates. These balls
40 are connected together by rivets k'. The holes in the balls k are conical and at their larger ends are larger than the holes in the crown or other similar heating plate. The rivets are made very hot at about the middle
45 of their lengths where they pass through the holes in the crown-plate. When the rivets are hammered over in the usual manner to secure the balls together, their middle portions are upset, forming shoulders m at the
50 opposite sides of the plate. These shoulders insure air-tight joints between the rivets and the plate. The heat is collected by the balls on one side of the plate and is transmitted through the rivets to the balls on the other
55 side of the plate. The use of these heat-transmitters increases the effectiveness of the furnace, and as many of them may be used as desired and at any part of the furnace found desirable.

60 In the modification of the furnace shown in Fig. 2 the water-jacket is dispensed with and the barrel is provided with a liner N of fire-clay around its lower part to prevent it from being overheated by contact with the
65 burning fuel. The tube h around the fuel-opening H is provided with a second flange n for securing it to the barrel; but, if desired,

its end may be secured in the position shown in Fig. 1 by expanding it in the opening in the barrel and beading its edge in a similar
70 manner to the tubes D. The barrel, chamber and casing are preferably circular and cylindrical; but I do not confine myself to making them thus, as they may be oval or of other shape, if desired. 75

What I claim is—

1. In a furnace, the combination, with a heat-transmitting plate, of a heat-transmitter comprising two balls arranged at opposite
80 sides of the plate, and a rivet passing through the said balls and plate and having shoulders bearing against the sides of the said plate, substantially as set forth.

2. In a furnace, the combination, with a barrel provided with a crown-plate at its top,
85 of an annular chamber surrounding the said barrel, a series of substantially horizontal tubes connecting the upper parts of the said barrel and chamber, a smoke-stack connected to the lower part of the said chamber, a grate
90 at the lower part of the barrel, a water-jacket surrounding the fuel-space in the said barrel, terminating below the said horizontal tubes and provided with circulating-pipes, and an
95 outer inclosing case provided with an inlet and an outlet for air, air-spaces being left between the said chamber and the said barrel and case, substantially as set forth.

3. In a furnace, the combination, with a heating-barrel, an annular chamber surround-
100 ing the said barrel, and an outer inclosing case, air-spaces being left between the said chamber and the barrel and case; of a tube secured to the said barrel and to the inner shell of the said chamber and forming an
105 opening for fuel, a ring interposed between the case and the outer shell of the said chamber, a tube secured to the aforesaid tube and provided with a flange at one end, means for
110 securing the said ring, flange and outer shell together, and a fire-door frame secured to the said ring outside the said case, substantially as set forth.

4. In a furnace, the combination, with a heating-barrel, an annular chamber surround-
115 ing the said barrel, and an outer inclosing case, air-spaces being left between the said chamber and the barrel and case; of a tube provided with two flanges secured respectively to the said barrel and to the inner shell
120 of the said chamber, a ring interposed between the outer shell of the said chamber and the case, a tube secured in the aforesaid tube and provided with a flange at its outer end, means for securing together the said ring,
125 flange and outer shell, and a frame secured to the said ring outside the case, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES H. READER.

Witnesses:

A. E. SMITH,
A. A. SMITH.