

(No Model.)

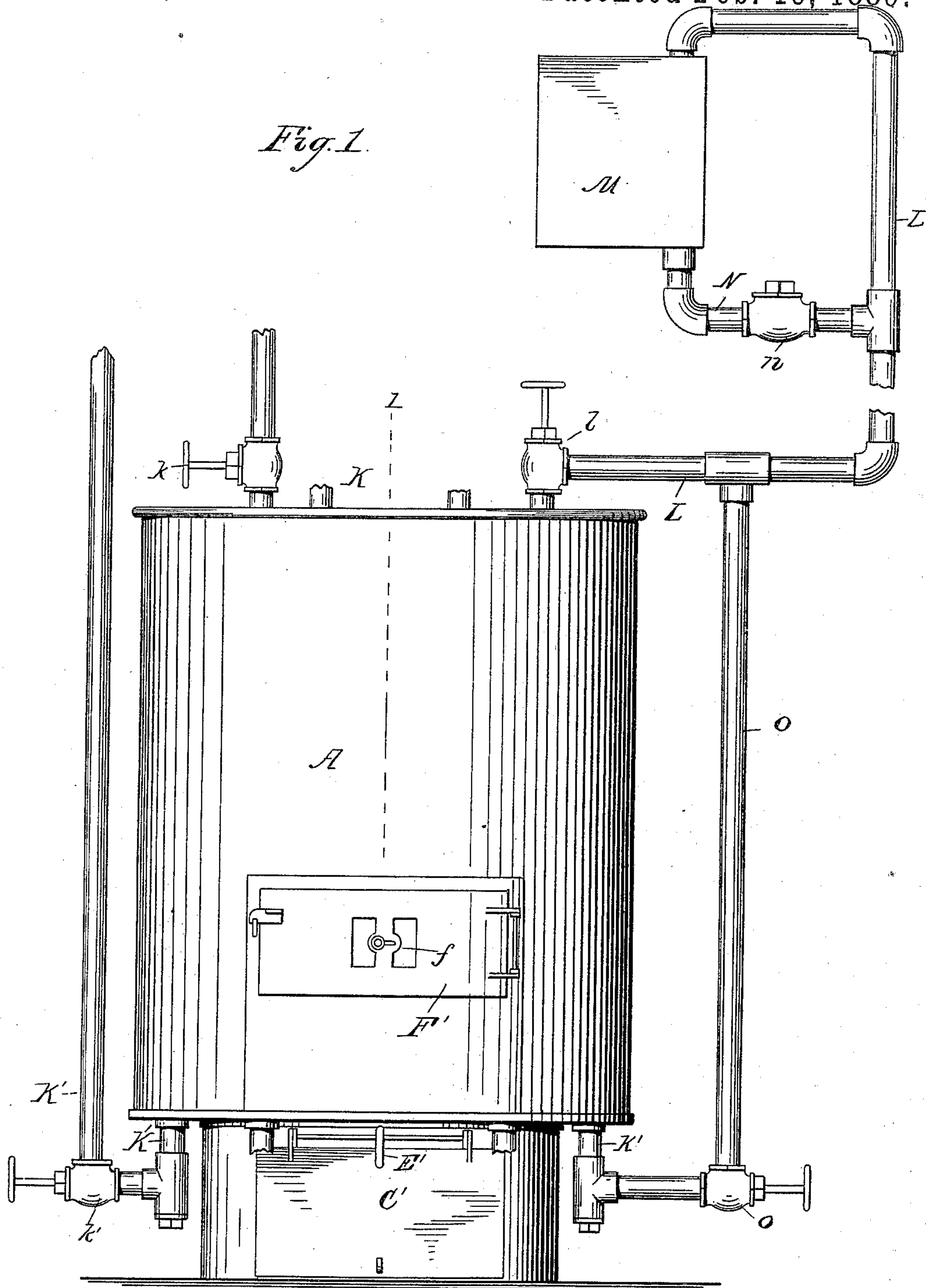
3 Sheets—Sheet 1.

W. J. BARNSTEAD.

APPARATUS FOR HEATING AND CIRCULATING WATER.

No. 398,217.

Patented Feb. 19, 1889.



Witnesses:

B. M. Whitaker.
Carrie Feigel

Inventor:

William J. Barnstead.
By Edwin Thacher
Atty.

(No Model.)

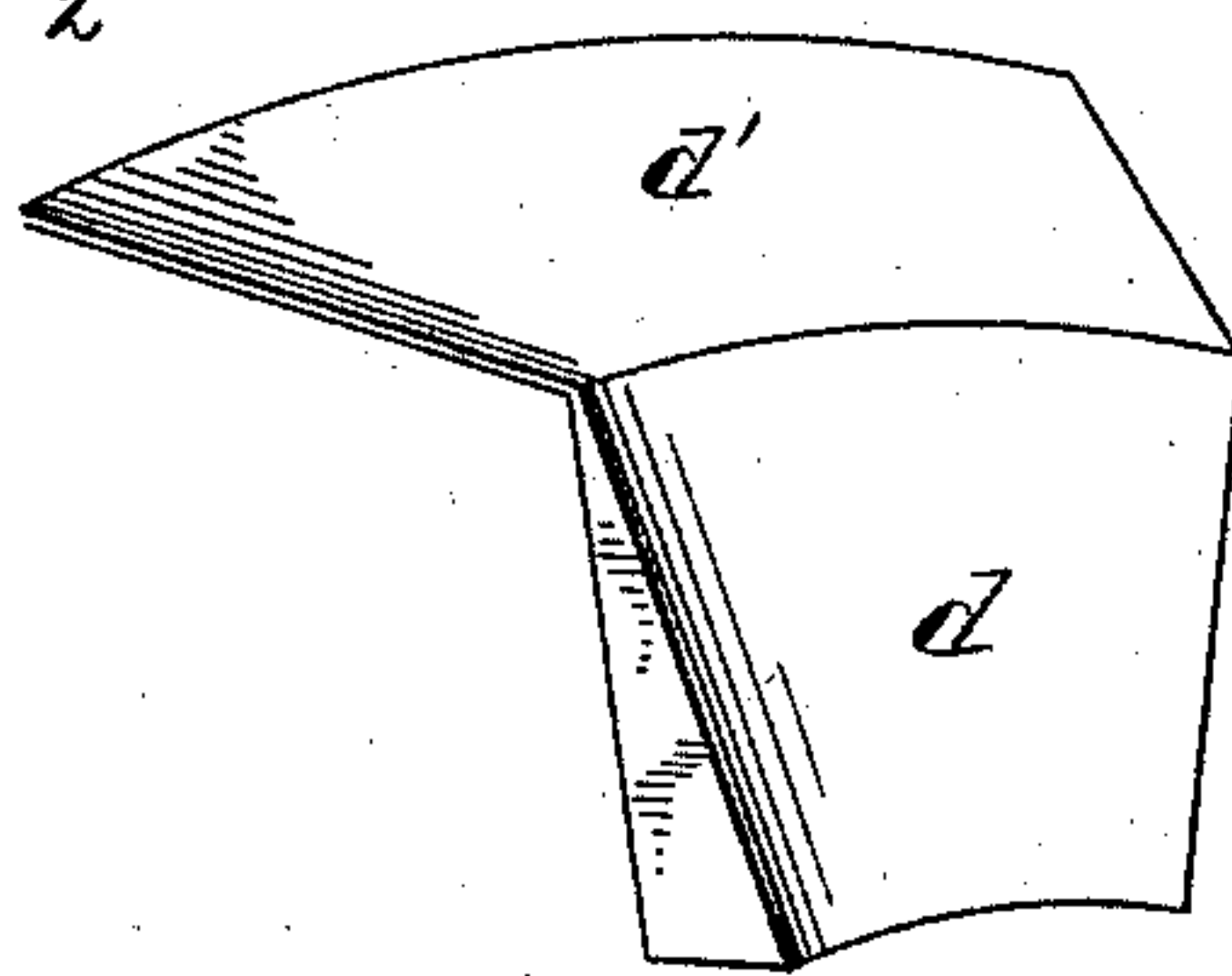
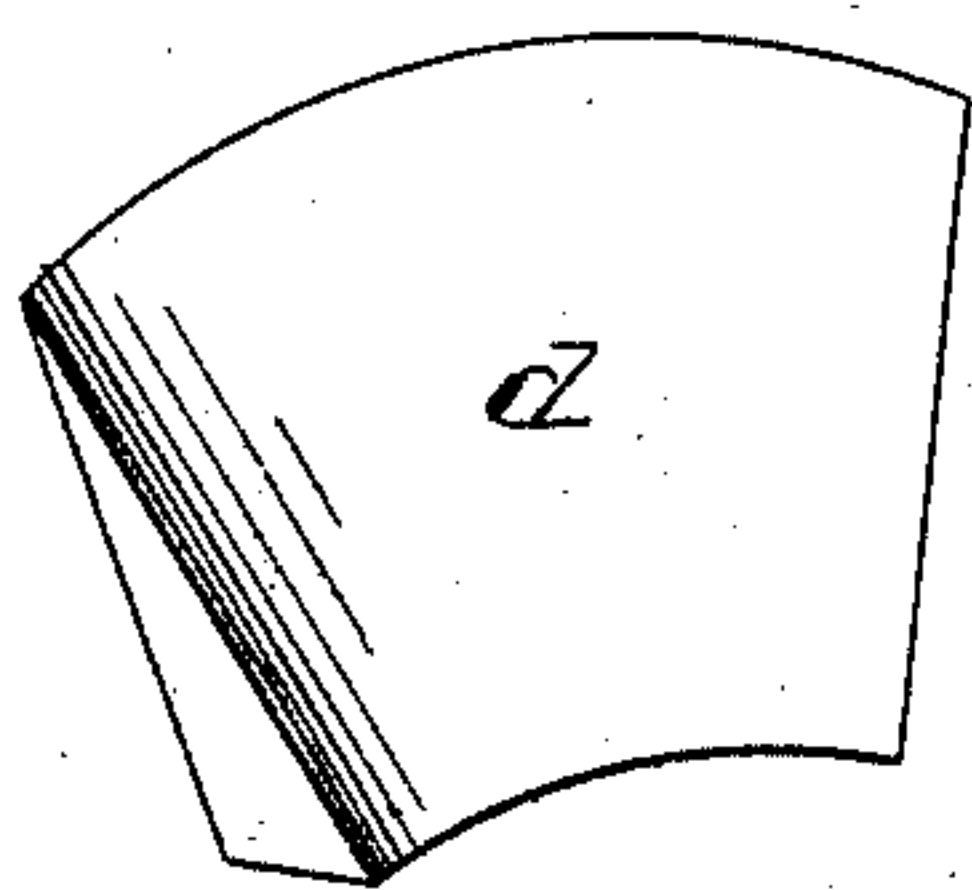
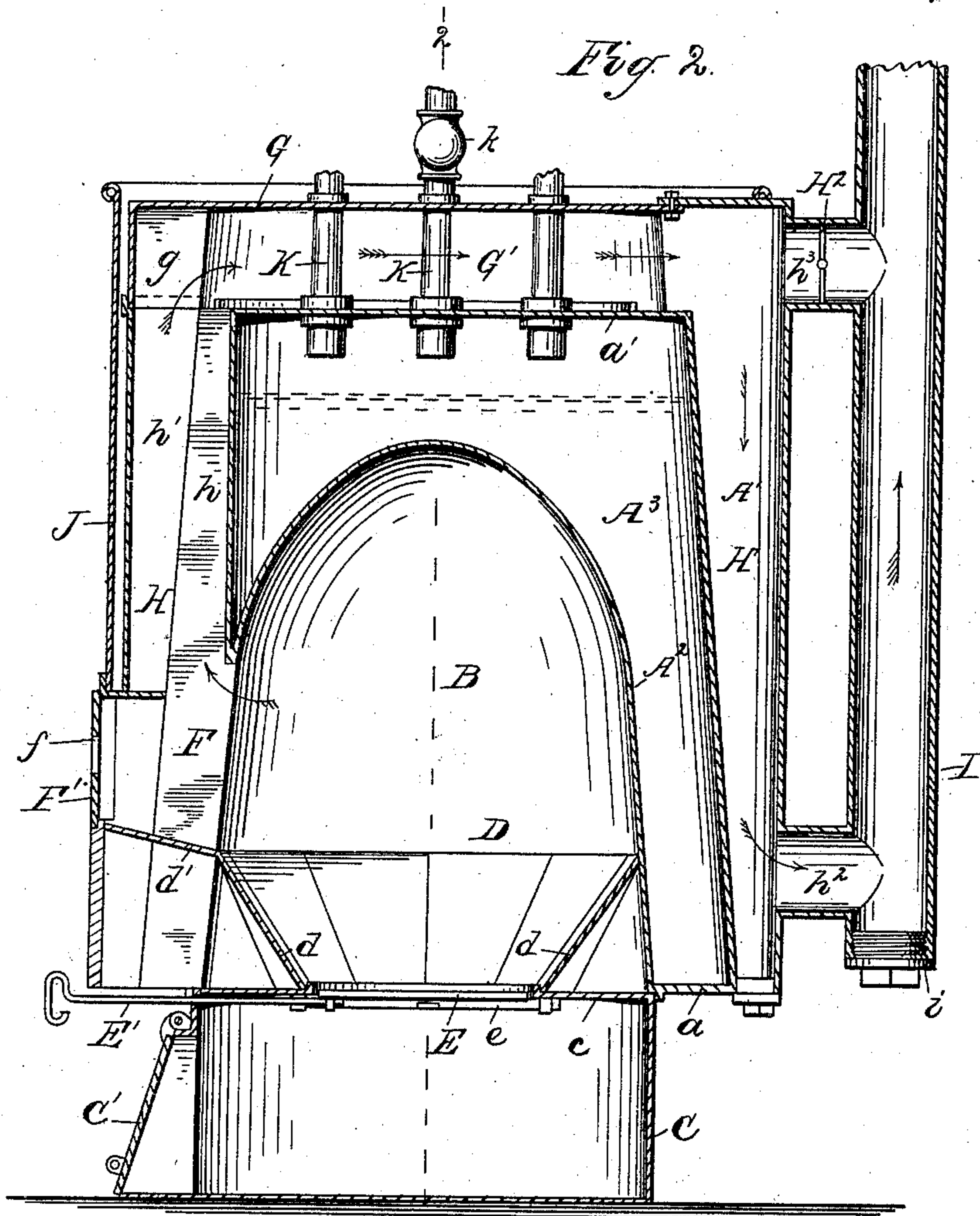
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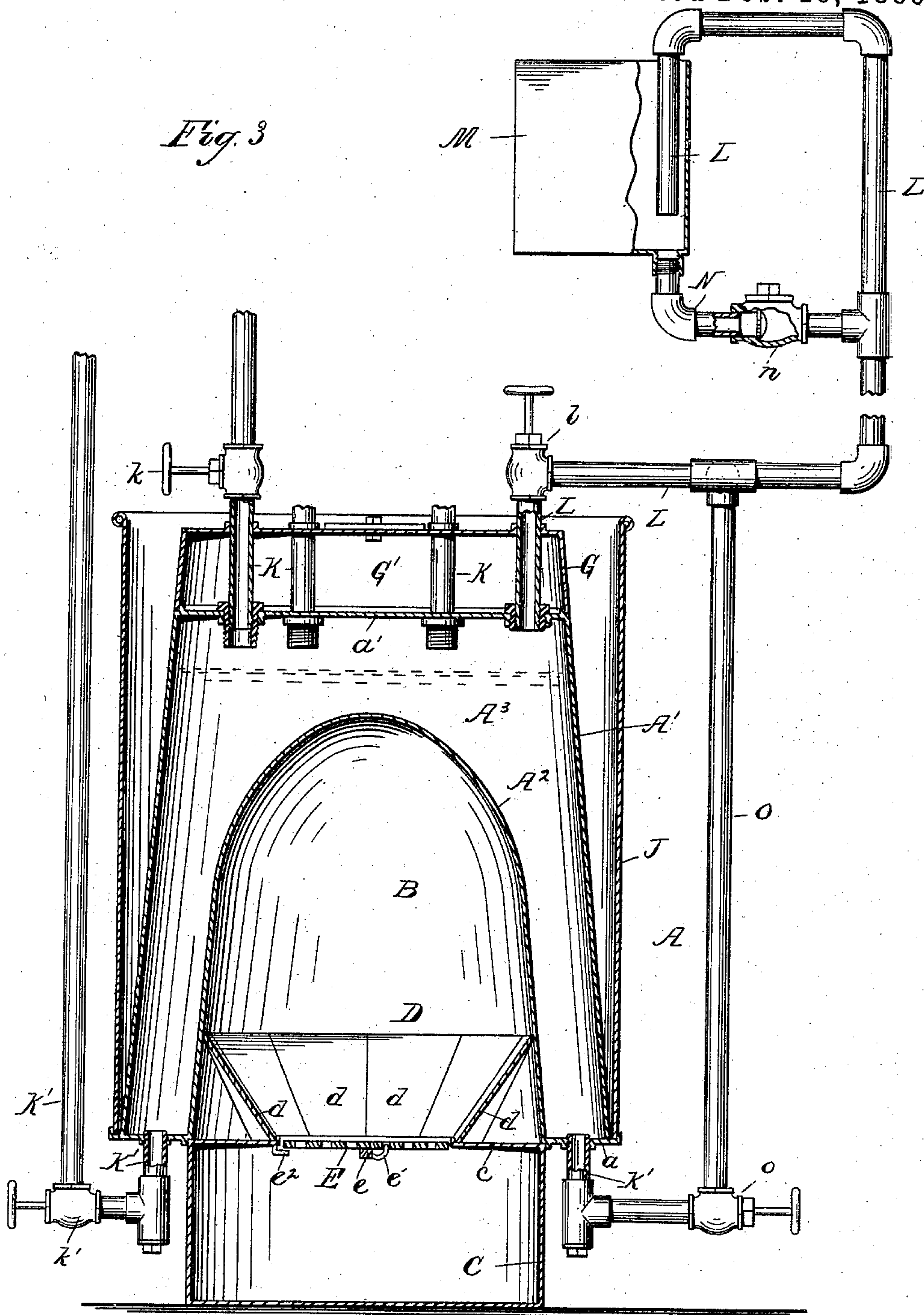
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Carrie Feigel

Inventor:
William J. Barnstead.
By *Coburn & Thacher*
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM J. BARNSTEAD, OF GALESBURG, ILLINOIS.

APPARATUS FOR HEATING AND CIRCULATING WATER.

SPECIFICATION forming part of Letters Patent No. 398,217, dated February 19, 1889.

Application filed June 11, 1888. Serial No. 276,768. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. BARNSTEAD, a citizen of the United States, residing at Galesburg, in the county of Knox and State of Illinois, have invented a certain new and useful Improvement in Apparatus for Heating and Circulating Water, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—
10 Figure 1 represents a front elevation of an apparatus embodying my invention; Fig. 2, a sectional view taken on the line 1 1 of Fig. 1; Fig. 3, a sectional view taken on the line 2 2 of Fig. 2; Fig. 4, a detail perspective view of one of the sections of the fire-pot detached, and Fig. 5 a similar view of another section.

Like letters refer to like parts in all the figures of the drawings.

My invention relates to apparatus for heating and circulating water, and has for its object to provide an apparatus of this description which shall possess both economy and safety in operation; and to these ends my invention consists in certain novel features, which I will now proceed to describe, and will then particularly point out in the claims.

In the drawings, in which I have shown my invention practically carried out in one form, A represents the boiler, which consists of an outer shell, A', having a frusto-conical shape, and an inner shell, A², the lower portion of which has its walls substantially parallel with those of the outer shell, A', while its upper portion is domed or conoidal in shape. The space between the inner and outer shells is closed at the bottom by means of a ring or annulus, a, and the top of the outer shell is closed by a disk-shaped plate, a'. The space A³ between the inner and outer shells, A' A², forms a water-space within which the water is heated, and the space B, inclosed by the inner shell, A², forms the furnace or combustion-chamber of the apparatus.

C represents a base upon which the apparatus is supported, it having the shape of a cylindrical drum, the interior of which forms an ash-pit, being provided at the front with a door, C', which serves not only to permit the cleaning of the ash-pit, but also to admit air to the fuel in the fire-pot. The base C is pro-

vided at its top with an annular inwardly-projecting flange, c, which serves to support the fire-pot D. This latter is composed of sections d, constructed of any suitable material and resting with their lower edges upon the flange c, their upper edges resting against the inner shell, A². These sections are of the wedge-shaped form shown in Figs. 4 and 5, so that when grouped together they will form a circular fire-pot having inclined walls. At the bottom of the fire-pot is arranged the grate E, which is supported upon a transverse bar, e, attached to the flange c, said bar being provided with a curved finger, e', which passes between the bars of the grate. A stop, e², attached to the flange c at one side, serves as a support for the grate when in position, and a rod or handle, E', projecting outward toward the front of the apparatus, serves not only as a means for rotating the grate in order to shake the same, but also as a means for tilting it upon the finger e' as a pivot in order to dump the fuel into the ash-pit.

At the front of the apparatus there is formed through both the inner and outer shells a passage, F, by means of which the fuel may be supplied to the combustion-chamber through a door, F', provided for this purpose at the front of the apparatus. That one of the sections d' of the fire-pot D which is arranged adjacent to its opening F has a flange, d', which extends to the door F', and thus closes the space below the said door.

G represents a hood mounted on the top of the boiler A and extending some distance above the same, thus leaving a space, G', between the top of the boiler and the top of the hood.

H represents a flue, which extends upward from the opening F to the said hood. The said flue, as shown, is formed partially in the wall of the boiler itself, which is recessed, as shown at h, for this purpose, and partially by means of a separate piece, h', secured to the front of the boiler and to the hood, which latter is provided with an extension, g, at the front at the point where the flue H enters the said hood. This particular way of forming the flue is not essential, however. At the rear of the hood G, at a point diametrically oppo-

site to that where the flue H enters the said hood, is arranged a second flue, H', extending downward along the outer shell, A', of the boiler from top to bottom. At its lower end
 5 this flue H is connected by means of a pipe, h^2 , to a suitable flue or pipe, I, by means of which the products of combustion are carried away. There is also arranged at the top of the flue H a direct connecting-pipe, h^3 , lead-
 10 ing to the pipe I and controlled by a damper, H², of any approved construction. The pipe I is closed at its lower end by means of a plug or cap, i , which is removable in order to permit the said pipe to be readily changed.

15 J represents a casing surrounding the entire boiler, said casing being cylindrical in shape and provided with suitable apertures for the door F' and its frame and for the flue H'. The space between this casing and the
 20 outer shell, A', may, if desired, be filled with sand or any other non-conducting material.

A series of pipes, K, lead upward from the top of the boiler A through the space G', inclosed by the hood G, and are carried thence
 25 to the various points to which it is desired to distribute the heated water. These pipes are each provided with a valve, k , by means of which the flow of water through them may be controlled, and each of these pipes extends
 30 downward a short distance into the interior of the space A³, formed within the boiler. A corresponding series of return-pipes, K', provided with valves k' , serve to return the water to the boiler, the said pipes entering
 35 through the annular bottom a' , as shown in Fig. 3.

L represents a pipe leading from the top of the boiler A to the expansion-tank M. This pipe does not extend quite as far downward
 40 into the boiler as do the pipes K, and is provided with a valve, l , by means of which it may be opened or closed as desired. The upper end of the pipe L is bent downward and carried down into the expansion-tank M, al-
 45 most, but not quite, to the bottom of the same. This tank M is arranged at a point overhead higher than any point reached by the pipes K or the radiators or other apparatus to which they are connected. It is provided at its bot-
 50 tom, and preferably at a point immediately underneath the end of the pipe L, with an outlet-pipe, N, which leads to the pipe L in the manner shown. The pipe N is provided with a check-valve, n , which opens freely away
 55 from the tank M, but will not permit the passage of any substance through the pipe N toward the said tank.

O indicates a pipe leading from the pipe L at a point below its connection with the pipe
 60 N to the boiler A, which it enters from below through the annular bottom a , said pipe O being provided with a valve, o , by means of which it may be opened or closed as desired.

The operation of the apparatus is as fol-
 65 lows: Water is supplied to the apparatus through the medium of the tank M in a sufficient quantity to fill not only the boiler A,

but also the various pipes connected thereto, and leaving about three inches of water stand-
 ing in the expansion-tank M. Fire is then
 70 built in the combustion-chamber B, the air which supplies the combustion being supplied underneath through the ash-pit and grate E. The combustion-chamber is, it will be seen, almost entirely surrounded by the boiler, the
 75 inner shell, A², of which forms the wall of the combustion-chamber, and is so shaped as to present a maximum heating-surface arranged in the most advantageous manner. The gases
 80 produced by the combustion in the combustion-chamber proper pass out through the opening F, where they meet a supply of air which is admitted through a suitable damper,
 85 f , in the door F'. This air mingles with the heated gases and produces what may be termed a "second combustion," thus serving to in-
 crease the temperature, obtain a more complete combustion of the fuel, and acting as a
 smoke-consumer. These burning gases pass
 90 upward through the flue H, and thence through the chamber G', formed by the hood G on the top of the boiler. Then they pass into the
 flue H' and either downward through the same and through the pipe h^2 into the pipe I or
 95 directly through the pipe h^3 into said pipe I, as may be desired.

It will be seen that the boiler is thoroughly heated, both internally and externally, so that a comparatively small amount of fuel will be
 sufficient to obtain the necessary degree of
 100 heat to communicate the same to the water contained in the boiler. The water thus heated passes upward through the pipes K, and in doing so passes directly through the
 105 chamber G', where the pipes are exposed to the action of the burning gases, and the water is heated a second time, and its temperature thereby raised at the point where it leaves
 the boiler. The water returns to the boiler
 110 through the pipes K', entering the same at the bottom, the circulation being the same as is usual in apparatus of this description.

In case the heat is raised above the point sufficient to generate steam, so as to cause a
 great increase in the bulk of water contained
 115 in the boiler and pipes, the steam thus formed will pass up through the pipe L, since it will first form at the top of the boiler, and the pipe L does not extend as far downward as
 the pipes K. Passing upward through the
 120 said pipe, it will be discharged into the expansion-tank M, where it is condensed and accumulates. When a sufficient quantity of water has accumulated in this tank to over-
 come the pressure of the steam upon the
 125 check-valve n , it will escape through the said check-valve, and, passing downward through the pipes L and O, will re-enter the boiler at the bottom thereof. All waste of water is
 130 thereby prevented, and the only loss is the slight one due to evaporation. The tank M cannot overflow, for the reason that the valve n will open before a sufficient quantity of water has accumulated therein to cause this

result. It is obvious that the danger of explosion of the boiler is done away with, since there is a free escape of the steam through the pipe L. If, however, it is desired to circulate steam instead of water through the pipes K and K', it is only necessary to close the valves l and o and increase the heat of the fire sufficiently for the purpose. The fire-pot, being constructed in sections in the manner described, may be readily repaired, in case it is damaged or worn out at any point, by removing the section which is damaged and replacing it with a new one, thereby obviating the necessity of inserting an entirely new fire-pot whenever a portion of the fire-pot is damaged. By filling the spacing between the outer facing, J, and the boiler A with non-conducting material the heat of the water in the boiler is prevented from radiating too rapidly, and thereby lowering the temperature.

I make no claim in the present application to the features relating to the expansion-tank and its connections, since the same forms the subject-matter of an application filed by me January 2, 1889, No. 295,224.

It is obvious that various modifications in the details of construction may be made without departing from the principle of my invention; and I therefore do not wish to be understood as limiting myself strictly to the precise details, either in form or construction, hereinbefore described, and shown in the drawings.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for heating and circulating water, the combination, with the boiler, of the centrally-located combustion-chamber having an opening at the front thereof and a flue arranged in the space between the casing and the boiler and extending upward from said opening to the top of the boiler, substantially as and for the purposes specified.

2. In an apparatus for heating and circulating water, the combination, with the boiler, of the centrally-located combustion-chamber having an opening at the front thereof and a flue arranged in the space between the casing and the boiler and extending upward from said opening to the top of the boiler and thence rearward over the top of the boiler, substantially as and for the purposes specified.

3. In an apparatus for heating and circulating water, the combination, with the boiler and the centrally-located combustion-chamber having an opening arranged at the front thereof and serving both as a charging and flue opening, of a suitable door or damper at the

front of said opening, and a flue arranged in the space between the casing and the boiler, leading upward from said opening to the top of the boiler and thence rearward over the top of the boiler, substantially as and for the purposes specified.

4. In an apparatus for heating and circulating water, the combination, with the boiler and the centrally-located combustion-chamber having an opening at the front of the same, of a flue arranged in the space between the casing and the boiler, extending upward from said opening along the boiler and thence rearward and downward along the boiler, substantially as and for the purposes specified.

5. In an apparatus for heating and circulating water, the combination, with the boiler and the centrally-located combustion-chamber having an opening at the front of the same, of a flue arranged in the space between the casing and the boiler, extending upward from said opening along the boiler and thence rearward across the top of the boiler and thence downward along the boiler, substantially as and for the purposes specified.

6. In an apparatus for heating and circulating water, the combination, with the boiler and the centrally-located combustion-chamber, of the hood arranged on top of the boiler and forming a second inclosed chamber within the main chamber between the casing and the boiler, an opening at the front of the combustion-chamber, and a flue leading upward from said opening to the second chamber, substantially as and for the purposes specified.

7. In an apparatus for heating and circulating water, the combination, with the boiler A, of the centrally-located combustion-chamber B, the opening F at the front thereof, and outer casing, J, the hood G, forming the chamber G' on top of the boiler within the space between the casing J and the boiler A, the flue H, leading from the opening F to the chamber G', and the water-pipes K, leading upward from the boiler through the chamber G', substantially as and for the purposes specified.

8. In an apparatus for heating and circulating water, the combination, with the frusto-conical outer shell, A', of the similarly-formed inner shell, A², forming the combustion-chamber, and having a domed conoidal top and an opening, F, in the front thereof communicating with the space between the outer casing and the boiler, substantially as and for the purposes specified.

WILLIAM J. BARNSTEAD.

Witnesses:

C. A. BANHART,

JOSEPH STAFFORD.