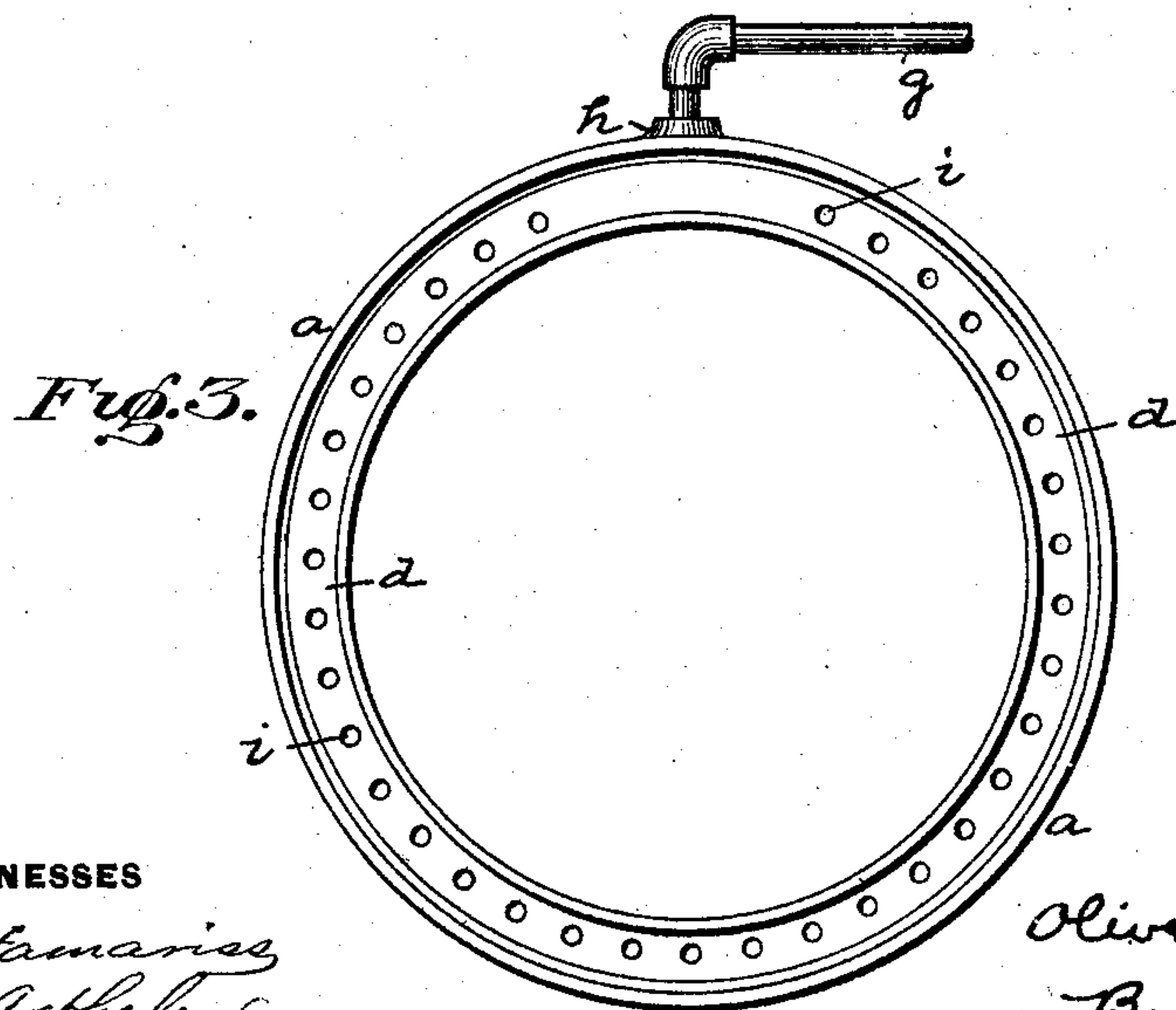
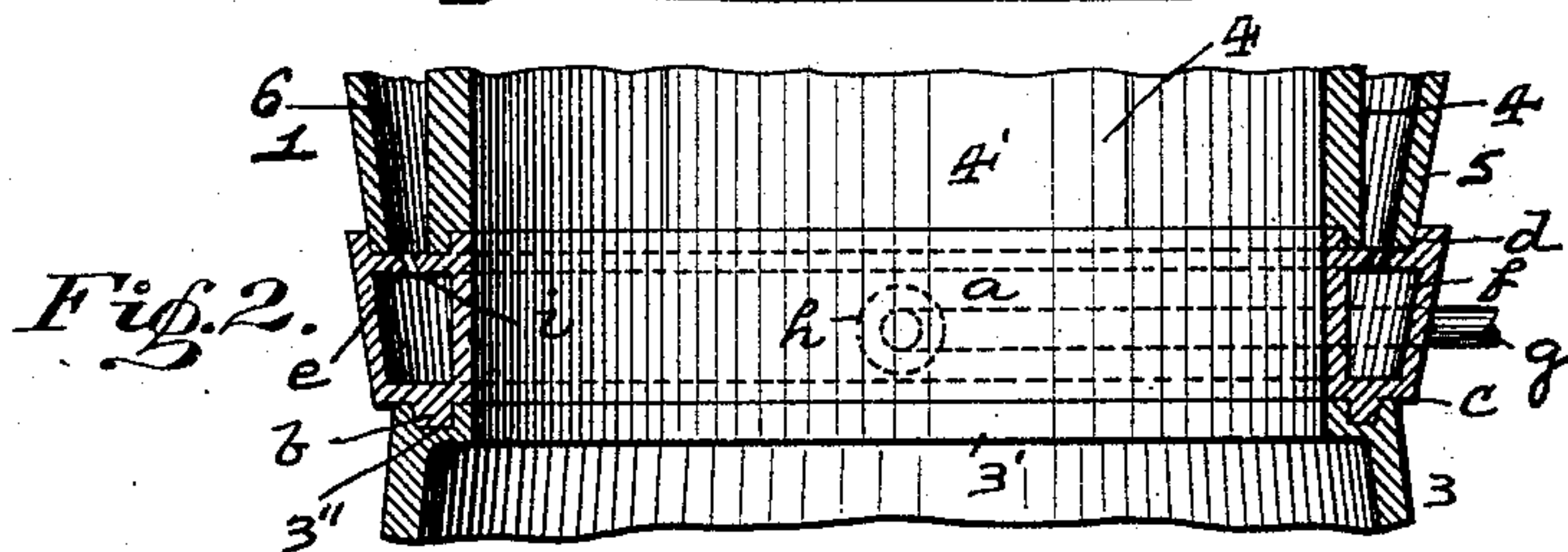
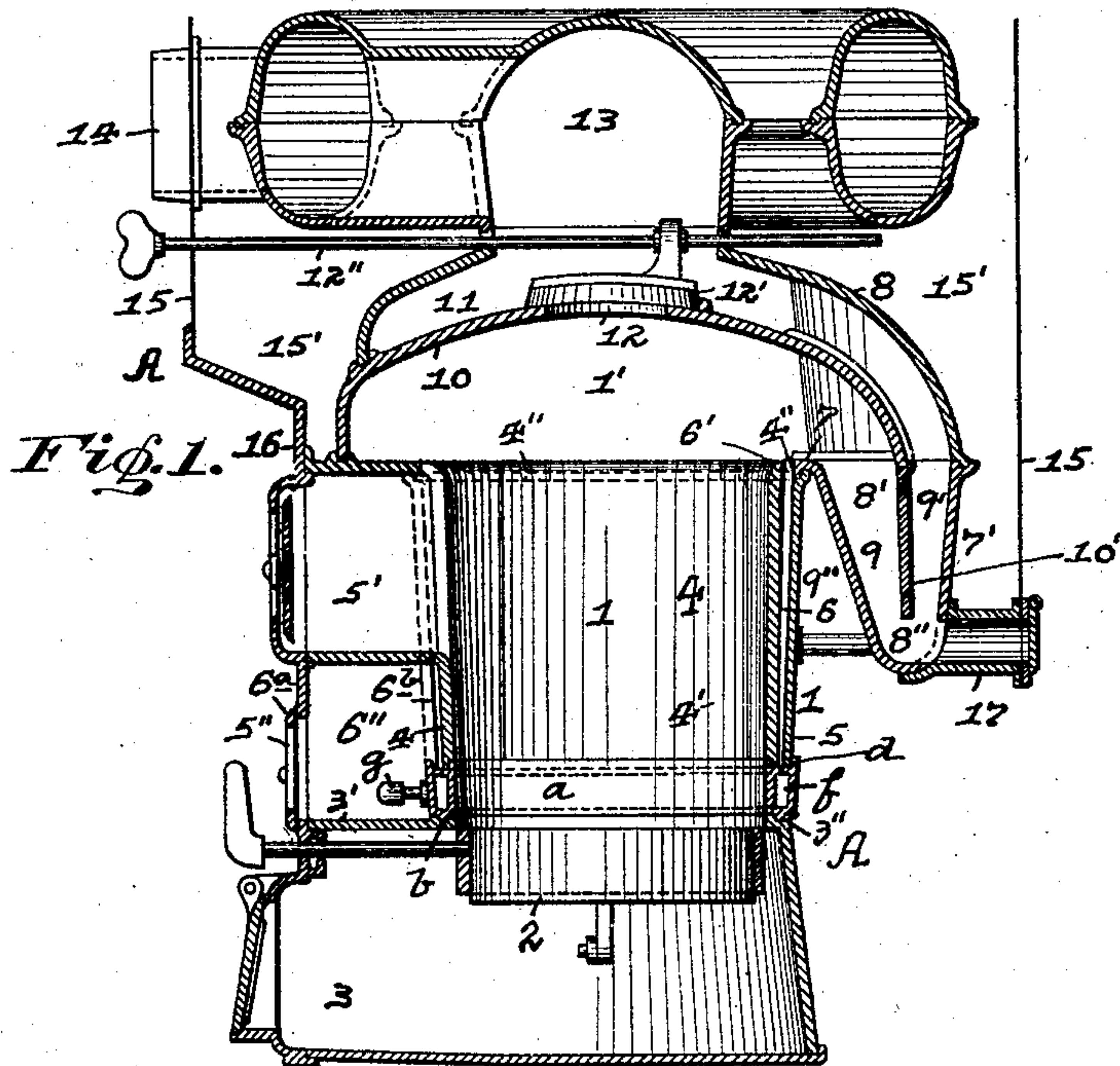


No. 842,126.

PATENTED JAN. 22, 1907.

O. L. BADGER.  
WARM AIR FURNACE.  
APPLICATION FILED OCT. 20, 1905.



WITNESSES

*Wm. Samaries*  
*R. H. Hethelw.*

INVENTOR

*Oliver L. Badger,*  
*By J. M. Cooke,*  
*Attorney*



# UNITED STATES PATENT OFFICE.

OLIVER L. BADGER, OF BELLEVUE, PENNSYLVANIA, ASSIGNOR TO  
UNITED STATES FURNACE & FOUNDRY COMPANY, OF DARLINGTON,  
PENNSYLVANIA, A CORPORATION OF WEST VIRGINIA.

## WARM-AIR FURNACE.

No. 842,126.

Specification of Letters Patent.

Patented Jan. 22, 1907.

Original application filed March 3, 1905, Serial No. 248,236. Divided and this application filed October 20, 1905. Serial No. 283,588.

*To all whom it may concern:*

Be it known that I, OLIVER L. BADGER, a resident of Bellevue, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Warm-Air Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to warm-air furnaces, and has special reference to what are known as "round-pot" furnaces, such as is shown and described in an application filed by me on March 3, 1905, Serial No. 248,236.

The object of my invention is to provide such a furnace with means whereby gaseous fuel can be used within the same without interfering whatever with the use of fuel other than gaseous, if it is desired, and without interfering with the formation of secondary combustion within such furnace in case such other fuel is used.

My invention consists, generally stated, in the novel arrangement, construction, and combination of parts, as hereinafter more specifically set forth and described, and particularly pointed out in the claims.

To enable others skilled in the art to which my invention appertains to construct and use my improved furnace, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a vertical central section of my improved warm-air furnace, taken through the fuel and ash-pan doors thereof and showing a surrounding casing. Fig. 2 is an enlarged cross-section of the gas-ring and its connecting parts, taken at right angles to that shown in Fig. 1. Fig. 3 is a top plan view of the same.

Like symbols of reference herein indicate like parts in each of the figures of the drawings.

As illustrated in said drawings, A represents my improved warm-air furnace of the construction shown in said application Serial No. 248,236, which is formed of cast metal and within which is the fuel-pot 1, having the shaking and tilting grate 2 at the lower end of the same and below which is the ash-pan 3. The fire-pot 1 is of circular form and extends upwardly in a vertical line above the ash-pan 3 and grate 2 and is preferably formed of a series of plates or linings

4' for constituting the inner shell 4 of said pot. The outer shell 5 of the fire-pot 1 extends upwardly around said inner shell 4 and is adapted to form a space 6 between said shells 4 and 5, such outer shell 5 being outwardly flaring from its bottom toward its top to provide for such space 6, being wider at its upper end than at its lower end. The linings 4' forming the inner shell 4 are provided with lugs 4'' at their upper ends for resting against a drop flue-plate 7 for the flues, hereinafter described, and are adapted to form openings 6' between the same for communicating with the space 6, which openings are preferably narrower in width than the width of the upper part of the space 6 to throttle the outlets from said space and create a pressure within the same.

Between the lower ends of the shells 5 and 6 and the upper wall 3' of the ash-pan 3 is a hollow gas-ring *a*, which is provided with an annular flange *b* on its lower face or bottom for fitting within an annular recess 3'', formed on said upper wall 3' to hold these parts in place and seal the same. This ring *a* is provided with an annular seat or recess *d* on its upper face or top wall *e*, within which the lower ends of the shells 4 and 5 of the fire-pot 1 are seated for supporting the same. Gas is supplied to the chamber *f* of the hollow ring *a* from a supply-pipe *g*, which is connected to a boss *h* on said ring and preferably at the front portion of said furnace A, while in the top wall *e* of said gas-ring *a* a series of gas-emission orifices *i* are formed for leading from the chamber *f* of said ring into the space 6 between the shells 4 and 5 of the fire-pot 1, such orifices *i* being formed at an outward incline in order to direct the gas against the outer shell 5 of said fire-pot. Air for combustion is supplied to the chamber of the gas-ring *a* through the usual air-mixer, (not shown,) which is connected to the gas-supply pipe *g* and located exteriorly of the furnace A, while cold air is also supplied to the space 6 between the shells 4 and 5 through a chute 6'', located below the fuel-chute 5'. This air is regulated by the damper 5'' in the door 6<sup>a</sup> of said chute 6'' and enters the space 6, which opens at 6<sup>b</sup> into said chute 6'' and is deflected into said space by the outer walls of the shell 4.

The drop-plate 7 forms the lower part of



the dome 8 and forms part of and extends down to form a series of cup-shaped sections 7' for a series of flue-chambers 8', having the double flues 9 9' formed therein by the division-wall 10' in said sections 8', connected with the diaphragm 10, which extends over and is supported above the fire-pot 1. This diaphragm 10 also forms the chamber 1' above the fire-pot 1 and the chamber 11 between the same and dome 8, while an opening 12 is formed in said diaphragm, which is opened and closed by a sliding damper 12', operated through a rod 12'', connected thereto. Above the dome 8 is the circular drum 13, which communicates with the chamber 11 and has the flue 14 thereon leading to the chimney or stack.

A casing 15 extends around the furnace A to form the hot-air chamber 15' around said furnace, and this casing is supported at its lower end by the front wall 16 of the furnace and by the cleaning-out chutes 17, which lead from each of the flue-chambers 8' and connect with the spaces or flues 8'' under the division-wall 10' of said section 8'.

The use and operation of my improved warm-air furnace are as follows: The gas is fed into the gas-ring *a* through the supply-pipe *g* and passes from the chamber *f* of said ring up through the orifices *i* into the space 6 between the outer and inner shells 4 and 5 of the fire-pot 1. As the gas passes through these orifices *i* it is impinged against said outer shell 5 by reason of said orifices being outwardly inclined and will act to heat up the walls of shells 4 and 5, and particularly the shell 5. Such gas in passing up said space 6 will meet with the air entering said space through the air-chute 6'' in order to obtain a better combustion of said gas, and then said gas or products of combustion will expand in passing up through said space 6 and said space being wider at its top than at its bottom will allow for such expansion, so that such gas passing out from said space through the opening 6' at the top of said inner shell 4 and into the chamber 1' above the fire-pot 1 will form a more perfect and secondary combustion at this point. After these products of combustion have thus passed into the chamber 1' they pass down through the flues 9 in the flue-chambers 8', through the flues 8'' under the ends 10' of the diaphragm 10, thence up through the flues 9' into the chamber 11 above said diaphragm, and thence into the drum 13 and out through the flue 14 to the chimney or stack. When it is desired to use coal or fuel other than gas within the furnace A, as in said application Serial No. 248,236, the gas supplied to the hollow ring *a* can be shut off and coal or such fuel to be used placed on the grate 2 within the fire-pot 1 through the fuel-chute 5', so that when fire is applied to said fuel the products of combustion therefrom will pass from

the pot 1 through the chamber 1', thence through the flues 9, 8'', and 9' to the chamber 11, and thence through the drum 13 and flue 14 thereon to the chimney or stack. Cold air for secondary combustion is introduced into the chute 6'' and into the space 6 around the fire-pot and will become heated from the pot 1 and in passing up said space will expand therein, so that such heated air will then pass out through the openings 6' at the top of the same into said chamber 1' and meet the products of combustion passing from the fire-pot 1 into said chamber 1', thence traveling with said products of combustion will pass through the flue-chambers 8' to the stack, as before described. The opening 12 can be opened by opening the damper 12', so that the products of combustion can pass directly out through the opening 12 in the diaphragm 10 from the fire-pot 1 and thence through the drum 13 to the chimney or stack instead of by way of the tortuous course through the flue-chambers 8' and chamber 11 to said drum and thence to the stack. The waste heat and products of combustion generated by the gas passing up through the space 6 into the chamber 1' and through the flues 9 9', chamber 11, and drum 13 to the stack or from the fuel in the fire-pot 1 and passing through said pot and the chambers, flues, and drum to the stack, as above set forth, will heat up the metal forming these parts, as well as their connecting parts, so that the heat therefrom will radiate from them and so heat the air, which air will be confined in the chamber 15', formed by the casing 15 around the furnace A, and such hot air can then be carried from said chamber by pipes to the rooms or different apartments in the building to be heated. When the furnace is thus in use, cold air is taken from the outside of the building or from the building in the usual manner and supplied to the chamber 15' in the casing 15 and through the bottom of said casing around the cleaning-out chutes 17, and such cold air will be drawn up into said chamber through said casing-bottom and will come in contact with and pass around the outside of the furnace A. Some of this cold air will also be drawn into and pass up through the spaces 9'' between the drop flue-chambers 8' and the outer shell 5 of the fire-pot, as well as between each of said flue-chambers 8', and thence up and around and in contact with the furnace A, so that such cold air and the cold air passing around the chutes 17 will come in contact with the parts of the furnace, and the heated air radiated from such furnace will pass through the chamber 15' to the rooms or apartments, as before described. The fuel or ashes can be removed or the grate cleaned of its ashes by tilting or shaking the grate 2 when desired in any suitable manner to remove or shake the ashes therefrom into



the ash-pan 3 of the furnace, and the flues 9, 9', and 8'' can be cleaned out at any time through the chute 17, so that any clogging material—such as ashes, dirt, &c.—which might accumulate in said flues can be taken out through said chute by any suitable means, and thereby allow the said flues to be free from any obstruction whatever.

It will be obvious that the cold air for producing a secondary combustion can be introduced into the bottom of the space 6 between the inner and outer shells of the fire-pot and from places other than those shown and described herein, and a number of openings can be made to lead into said space for conducting the air thereto, while any suitable form of a radiating-drum can be placed above the drum of the furnace, if desired.

Various other modifications, additions, and changes in the design and construction of my improved warm-air furnace can be resorted to without departing from the spirit of my invention or sacrificing any of its advantages.

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

1. A warm-air furnace comprising a fire-pot, an inner casing or shell in said pot for forming a chamber within and around said pot and having escape-openings at the top of the same, and a separate hollow ring fitting under the fire-pot wall and said shell for supporting the same and supplying gaseous fuel to said chamber.

2. A warm-air furnace comprising a fire-pot, an ash-pan having a seat in the top of the same, an inner casing or shell in said pot for forming a chamber within and around said pot and having escape-openings at the top of the same, and a separate hollow ring under said chamber for supplying gaseous fuel to the same, said ring having a flange on the bottom thereof for fitting within said seat to hold said ring in place.

3. A warm-air furnace comprising a fire-pot, an inner casing or shell in said pot for

forming a chamber within and around said pot and having escape-openings at the top of the same, and a separate hollow ring under said chamber for supplying gaseous fuel to the same and having a seat in its upper face for the lower ends of said shell and fire-pot wall to support the same in place.

4. A warm-air furnace comprising a fire-pot, an inner casing or shell in said pot for forming a chamber within and around said pot and having escape-openings at the top of the same, a separate hollow ring fitting under the fire-pot wall and said shell for supporting the same and supplying gaseous fuel to said chamber, and means for supplying air to said chamber to produce secondary combustion.

5. A warm-air furnace comprising a fire-pot, an ash-pan having a seat in the top of the same, an inner casing or shell in said pot for forming a chamber within and around said pot and having escape-openings at the top of the same, a separate hollow ring under said chamber for supplying gaseous fuel to the same, said ring having a flange on the bottom thereof for fitting within said seat to hold said ring in place, and means for supplying to air said chamber to produce secondary combustion.

6. A warm-air furnace comprising a fire-pot, an inner casing or shell in said pot for forming a chamber within and around said pot and having escape-openings at the top of the same, a separate hollow ring under said chamber for supplying gaseous fuel to the same and having a seat in its upper face for the lower ends of said shell and fire-pot wall to support the same in place, and means for supplying air to said chamber to produce secondary combustion.

In testimony whereof I, the said OLIVER L. BADGER, have hereunto set my hand.

OLIVER L. BADGER.

Witnesses:

J. N. COOKE,  
R. H. AXTHELM.