

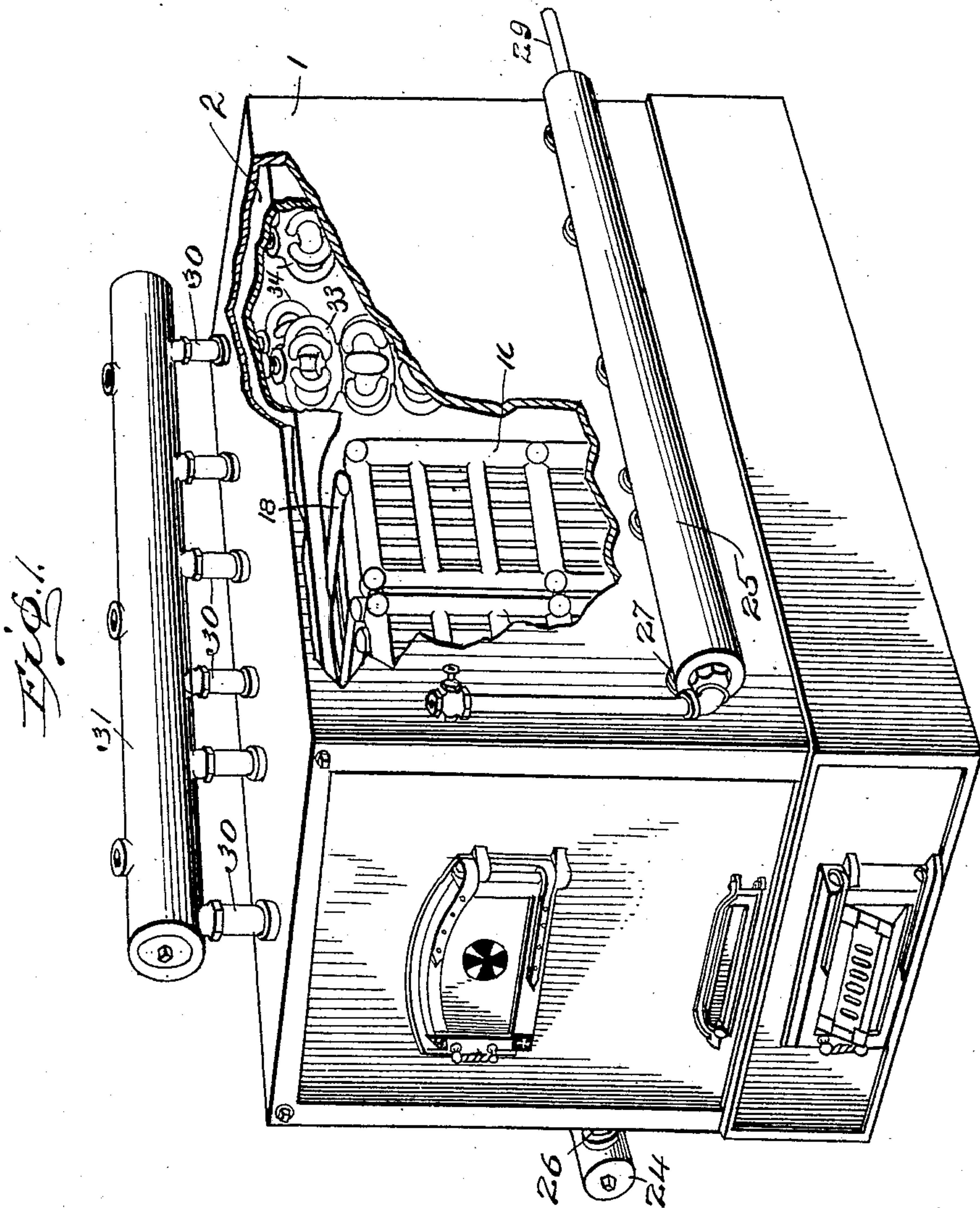
J. G. ENGELHART.  
FURNACE.

APPLICATION FILED NOV. 16, 1907.

908,228.

Patented Dec. 29, 1908.

3 SHEETS—SHEET 1.



Inventor

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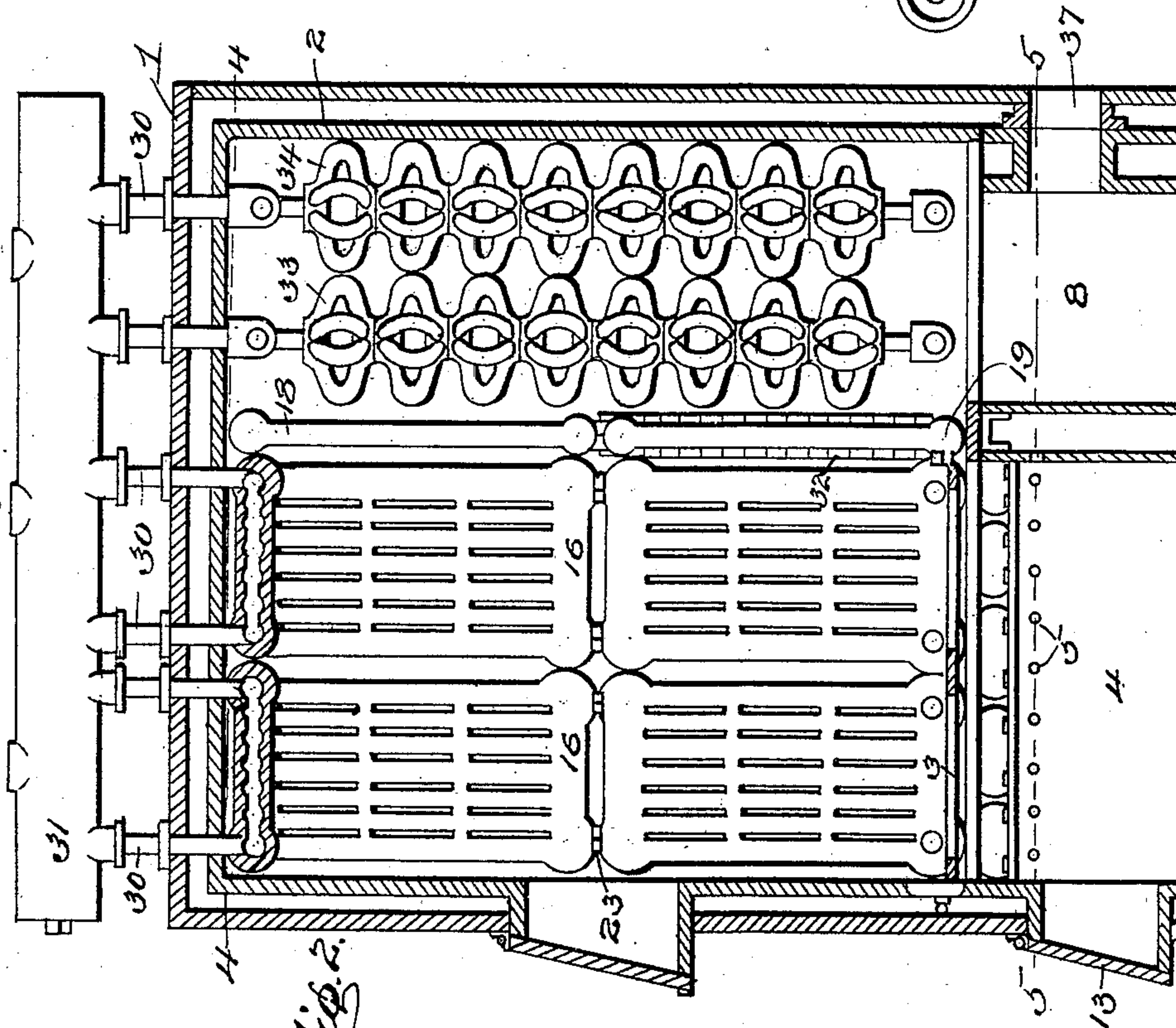
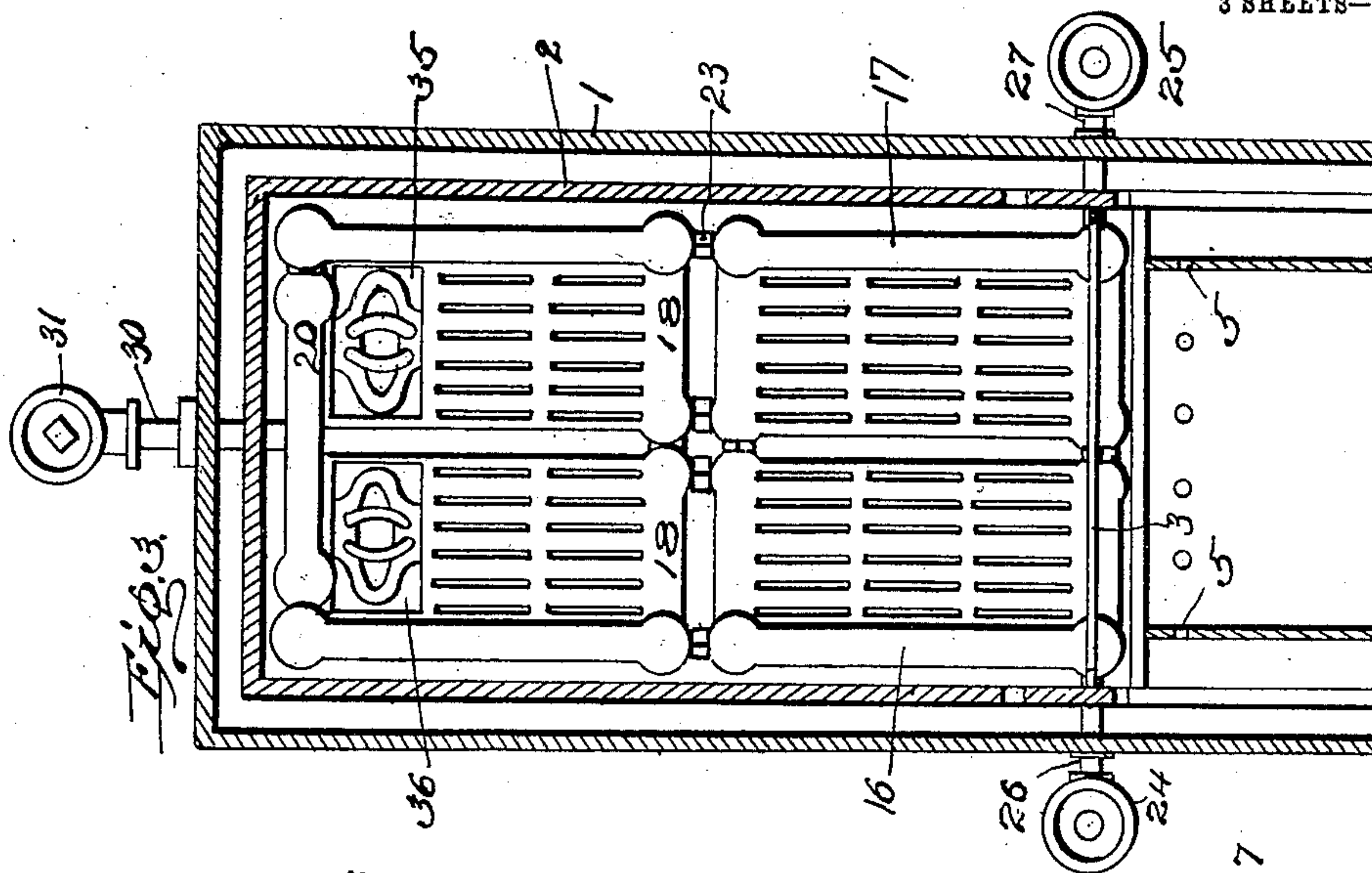
Witnesses  
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A. L. Kitchen

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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 5.

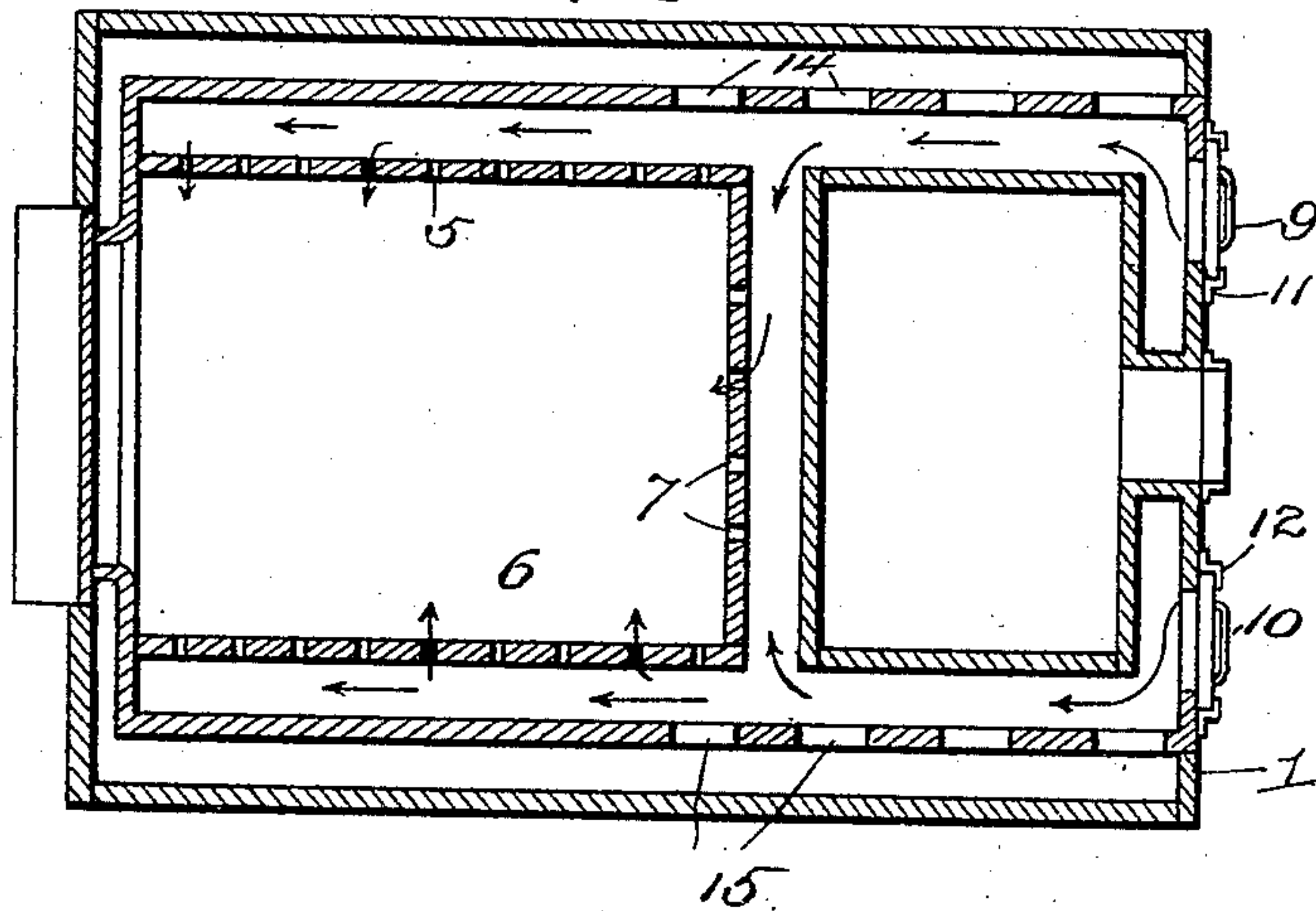


Fig. 4.

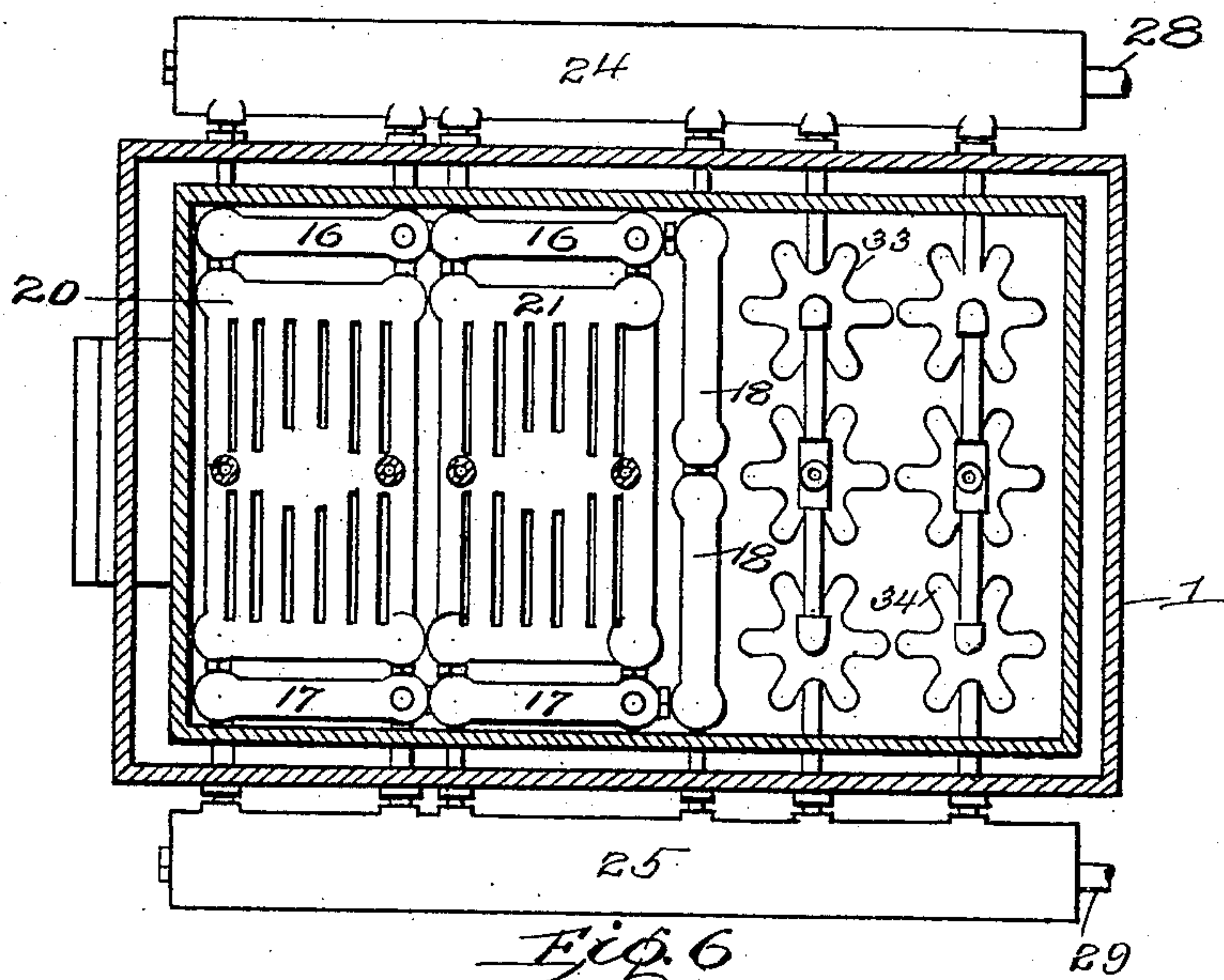
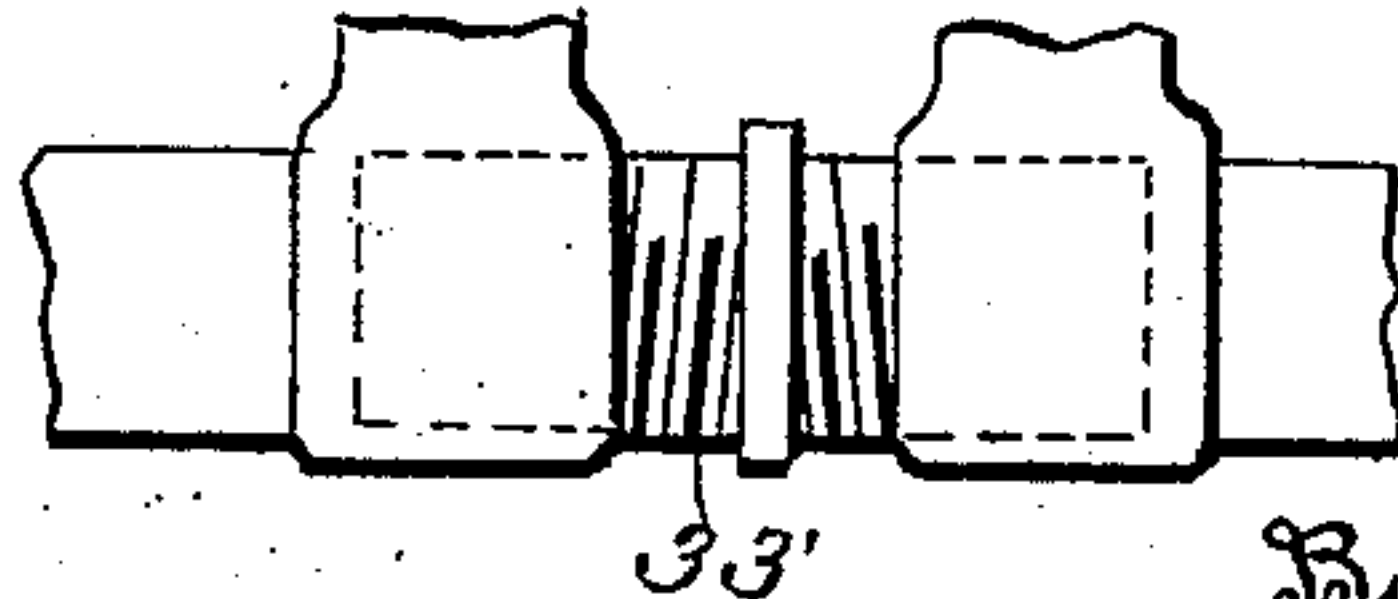


Fig. 6.



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# UNITED STATES PATENT OFFICE.

JOHN G. ENGELHART, OF ATLANTA, GEORGIA.

## FURNACE.

No. 908,228.

Specification of Letters Patent.

Patented Dec. 29, 1908.

Application filed November 16, 1907. Serial No. 402,498.

*To all whom it may concern:*

Be it known that I, JOHN G. ENGELHART, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to furnaces, and particularly to water or steam heating furnaces in which hot water or steam is rapidly provided and where the circulation in the furnace is very rapid for absorbing the highest possible number of heat units.

The invention comprises the production of a plurality of tubes arranged for coming in contact directly with the flame from the fire chamber and a plurality of auxiliary heating tubes for forming auxiliary heating means.

The invention further comprises the production of a furnace having radiator sections forming the fire chamber and a plurality of heating tubes positioned in proximity thereto for absorbing a large percentage of the heat units passing through the radiator sections, the radiator sections and the auxiliary heating tubes being connected to a header or chamber for distribution, as may be desired.

The invention still further comprises the production of a furnace provided with a plurality of independent units for containing water that is designed to be heated, and headers connected thereto for providing means of circulation of water in the units and for also providing means by which heated water may be taken off and fresh water again supplied to the units.

The object in view is the production of a furnace formed of a plurality of independent units that are designed to contain water, and means for providing a path for the circulation of water through the units.

A further object in view is the production of a furnace in which two sets of heating systems or tubings may be used, the first forming a fire box for utilizing the direct heat from the fire, and the second to utilize the heated gases, the flame, etc., from the fire as the same passes toward the chimney.

Another object in view is the production of a furnace formed of commercial radiator sections connected up for forming a fire chamber and for forming auxiliary heating means in proximity to the fire chamber.

A still further object in view is the provision of a plurality of water heating tubes

or receptacles, a housing for holding the heat in proximity to the heating tubes, means for providing a draft, and a supply of heated air for the fire chamber of the furnace, so that the heat and products of combustion are drawn in such manner as to contact with the heating chambers and thus permit the same to absorb the largest possible number of heat units.

With these and other objects in view, the invention comprises certain novel constructions, combinations and arrangements of parts, as will be hereinafter more fully described and claimed.

In the drawings: Figure 1 is a perspective view of my improved furnace, certain parts being broken away in order to show the relative position of the heating tubes or members. Fig. 2 is a central, vertical section through a furnace formed according to the present invention. Fig. 3 is a front elevation of a furnace formed according to the present invention, the front plate being removed. Fig. 4 is a section through Fig. 2 on line 4—4. Fig. 5 is a section through Fig. 2 on line 5—5. Fig. 6 is an enlarged detail view showing a connecting tube or nipple.

In the present invention it is designed to use preferably ordinary commercial material in a new and advantageous way for accomplishing results not heretofore accomplished. In addition, a number of new detail features are provided for assisting in properly arranging the various old elements *per se* in order to accomplish the various advantages secured by the present invention.

Referring more particularly to the drawing: 1 indicates a housing or shell of any desired kind, and 2 an inner housing of any desired kind, preferably sheet metal. The housing 1 may be dispensed with if found desirable, but housing 2 is necessary in order to hold the heat in proximity to the heating tubes or members hereinafter fully set forth.

Positioned within housing 2 is a grate 3 of any desired construction arranged above an ash pit 4. The ash pit 4 is provided with openings 5, 6 and 7, near its upper edge, as clearly seen in Figs. 2, 3 and 5. The air fed to the furnace proper passes through these apertures or openings, and before reaching these apertures is heated by coming in contact with the warm walls of the ash pit, and also chamber 8 through which the burned products of combustion, smoke, and the like are designed to pass. Doors 9 and 10 are



provided in the rear of the furnace for regulating the amount of air permitted to be fed to apertures 5, 6 and 7. In order to more properly regulate the doors 9 and 10, the same are mounted in slides 11 and 12 so as to be opened to any desired extent for regulating the amount of air fed beneath grate 3 through apertures 5, 6 and 7. In this way, any desired amount of air may be fed into the furnace and the same heated to a considerable extent before reaching the fire chamber. It will be evident, however, that if additional air is desired the door 13 may be opened, but in this instance the air will be cool and will not act in such an advantageous manner as the air from doors 9 and 10. When the housing 1 is used, openings 14 and 15 are provided in housing 2 as seen in Fig. 5, so that the heated air in the space between the two housings will escape into and through apertures 5, 6 and 7. It will be evident, also, that if desired air may be fed in above the grate from between the housings 1 and 2 by simply providing openings in the housing 2 above the grate.

Positioned on each side of the grate 3 are radiator sections 16—16 and 17—17, and at one end of the grate radiator sections 18—18 and 19—19. Positioned above the grate 3 near the top of the furnace are sections 20 and 21. The various sections are connected together at their various points of contact with a connecting cable or tube 23 that is designed to permit water or steam to pass from one section to the other freely as the water is heated. By providing sections on each side of the grate 3 at the back and above a chamber is formed for the grate and is designed to take the place of the ordinary fire box or chamber in the ordinary furnace. As will be evident, any fire upon grate 3 will come in direct contact with the various sections surrounding the same, so that all the heat that is produced is brought in close proximity to the article desired to be heated. In practical use, the present invention may be used either as a steam heater or a hot water heater, but as shown in the drawings the same is constructed for heating buildings by the hot water system.

In order to provide for the circulation of the water, headers 24 and 25 are provided on each side of the furnace. The headers 24 and 25 are connected by tubes 26 and 27 to various radiator sections at the bottom of the furnace so that water coming from the heating system through pipes 28 and 29 will pass through headers 24 and 25 and pipes 26 and 27 into the various heating sections and from thence upward through pipes 30 into a header 31 positioned at the top of the furnace. From the header 31 the heated water is passed through pipes in the usual manner to the various radiators of the building, and from thence back again to headers 24 and 25.

Sections 19—19 are provided with a filling of brick or fire-proof material 32 which will prevent the flame from the fire on grate 3 passing through the openings in section 19, but will compel the blaze to pass over the entire section and through the sections 18—18. In this manner the flame is compelled to travel upward and come substantially in contact with all the various heating sections or members 33 and 34. The auxiliary heating members 33 and 34 are formed in a plurality of sections built up to any desired length and arranged so that water entering from headers 24 and 25 at the bottom will pass upward and finally out into header 31. There may be any desired number of auxiliary heater sections 33 and 34, but it is preferable to fill the rear of the furnace substantially full of the same so as to compel the flame passing through sections 18—18 to come in contact with the various heaters and to consequently permit the same to absorb a large percentage of the heat units contained in the flame. By reason of bricks or filling 32 the flame from the fire on the grate will be compelled to pass upward and through sections 18—18, and particularly through openings or windows 35 and 36 and in contact with the upper sections or members 33 and 34. From the upper members 33 and 34 the flame passes downward into smoke chamber 8 and from thence out opening 37 to any suitable chimney or draft means. In this way, the radiator sections forming the fire chamber absorb heat units as the flame rises and heating tubes or members 33 and 34 absorb heat units as the flame and hot products of combustion descend, so that by the time the burned products of combustion pass out opening 37, the same is substantially deprived of all its heat units. By the use of the radiator sections as set forth, a comparatively thin sheet or stream of water is passed in proximity to the heat and consequently will rapidly absorb the heat units and be raised in temperature in a short space of time.

In action, when the fire is started on grate 3, doors 9 and 10 are opened, permitting air to be furnished to the fire. As the air leaves the doors 9 and 10, the same passes forward between the housing 2 and the ash pit 4 and smoke chamber 8, until it reaches apertures 5, 6 and 7. After the air has passed through apertures 5, 6 and 7, it passes upward through the fire on grate 3 and from thence on upward through the various openings in the side sections 16—16 and 17—17, and also through the small openings in 18—18 and through the large openings or windows 35 and 36. After passing through the small openings set forth and the large openings or windows 35 and 36, the air passes downward and contacts with members 33 and 34 in its passage. After leaving members 33 and 34



it passes through smoke chamber 8 and out opening 37 to a chimney or other draft appliance. In this way the air is caused to circulate in such a way as to come into contact with all of the various water heating members and to cause the flame or heat of the fire on grate 3 to contact with the various water heating members. The water in the various sections being heated will rise into header 31, and from header 31 will pass upward into any desired number of radiators and from thence back to headers 24 and 25. From headers 24 and 25 the water will pass into the lower part of the various water heating sections and again pass upward to header 31 to be again distributed to the radiators. This action of the water is very rapid, as the same is quickly heated when passing through the various heating sections of the furnace. By arranging heating sections that will rapidly heat the water contained therein, a comparatively small furnace will keep a comparatively large system well supplied with hot water with an ordinary fire, as substantially all the heat units are absorbed and transmitted to the water.

In providing a furnace and boiler according to the present invention, one of the principal ideas in mind is the provision of a boiler constructed of independent units that, if desired, may be interchanged. The units are also preferably made from standard material which is already on the market, as, for instance, cast radiator sections. By taking a radiator section of any desired size, the same may be built up, in accordance with the present invention, into any sized boiler that may be desired and yet present a heating surface against which a heating flame may impinge for permitting the water passing through the independent units or radiator sections to absorb the greatest possible number of heat units. In connection with the boiler proper is provided a housing therefor for inclosing and directing the heating flame and also for providing means for heating air that is designed to be fed into the fire box for permitting the perfect combustion of fuel, and consequently the elimination of smoke, or the substantial elimination of smoke.

It will also be observed that the invention is susceptible for use as a furnace for a steam heating system as well as for hot water heating systems. By connecting a few units together a small boiler may be constructed for use when only a small amount of heated water or steam is desired, but when a considerable amount of heated water or steam is desired a corresponding number of units may be added without departing from the spirit of the present invention.

The headers 33 and 34 are preferably constructed and positioned as shown in the drawing for providing an extended space for

the circulation of water to a heating medium. The various sections from which members 33 and 34 are constructed are preferably cast and the same secured together by suitable connecting pipes or, if desired, by the nipple 33'.

What I claim is:

1. A device of the character described, comprising independent units secured together for forming a fire box, a plurality of units in the rear of said first mentioned units and at right angles thereto, for receiving the flame from said fire box, a header for supplying water to the lower end of all of said units, and a header for receiving heated water from the upper end of said units.

2. A device of the character described, comprising a furnace formed with a plurality of units, some of said units forming a fire box, other of said units forming baffling means through which a flame from said fire box is designed to pass, and the remaining units positioned above said fire box and connected to the units forming said fire box, so as to receive all of the water therefrom, said last mentioned units forming superheating means for said water, means for supplying water to said units, and means for receiving heated water therefrom.

3. A device of the character described, comprising a boiler formed with a fire chamber, a grate for said chamber, a casing surrounding said boiler and said grate, a second casing surrounding said first mentioned casing, means positioned between said casings for providing a tortuous passage for air therethrough, said air being designed to pass into said fire box above said grate, and means below said grate for feeding air to said fire below the grate.

4. A device of the character described, comprising a grate, a plurality of water circulating chambers connected together, spaced from each other, and forming a fire-box, a plurality of water circulating chambers in the rear of the first mentioned water circulating chambers and arranged to receive the flame from the fire-box, the last mentioned water circulating chambers being arranged in series and independent of each other and connecting with the first mentioned water circulating chambers, means for supplying water to all of the water circulating chambers, and means for drawing water from the upper ends of all of the water circulating chambers.

5. A device of the character described, comprising a fire grate, a plurality of water circulating grids spaced from each other and arranged at right angles to each other above the grate and connected together to form a fire-box, a plurality of water circulating members arranged in the rear of said grids and arranged to receive the flame from the fire-box, said grids and said water circulating chambers being connected together, means



for supplying water to the lower ends of all the water circulating members, and means for drawing water from the upper ends of all of said members.

- 5 6. In a device of the character described, a combustion chamber, a plurality of water circulating grids connected together and spaced from each other and lining said chamber, a plurality of series of water circulating  
10 members connected with said grids, a partition located between the grids and said water circulating members, means for supplying water to the lower ends of all of the

grids and the water circulating members, means for drawing water from the upper 15 ends of all of the water circulating members, and means for supplying a draft from said combustion chamber and through said partition and said water circulating members.

In testimony whereof I affix my signature 20 in presence of two witnesses.

JOHN G. ENGELHART.

Witnesses:

JAMES O'DONNELL,  
J. M. WOOD.