

No. 834,640.

PATENTED OCT. 30, 1906.

F. D. POTTER.  
WATER TUBE BOILER.  
APPLICATION FILED NOV. 11, 1905.

2 SHEETS—SHEET 1.

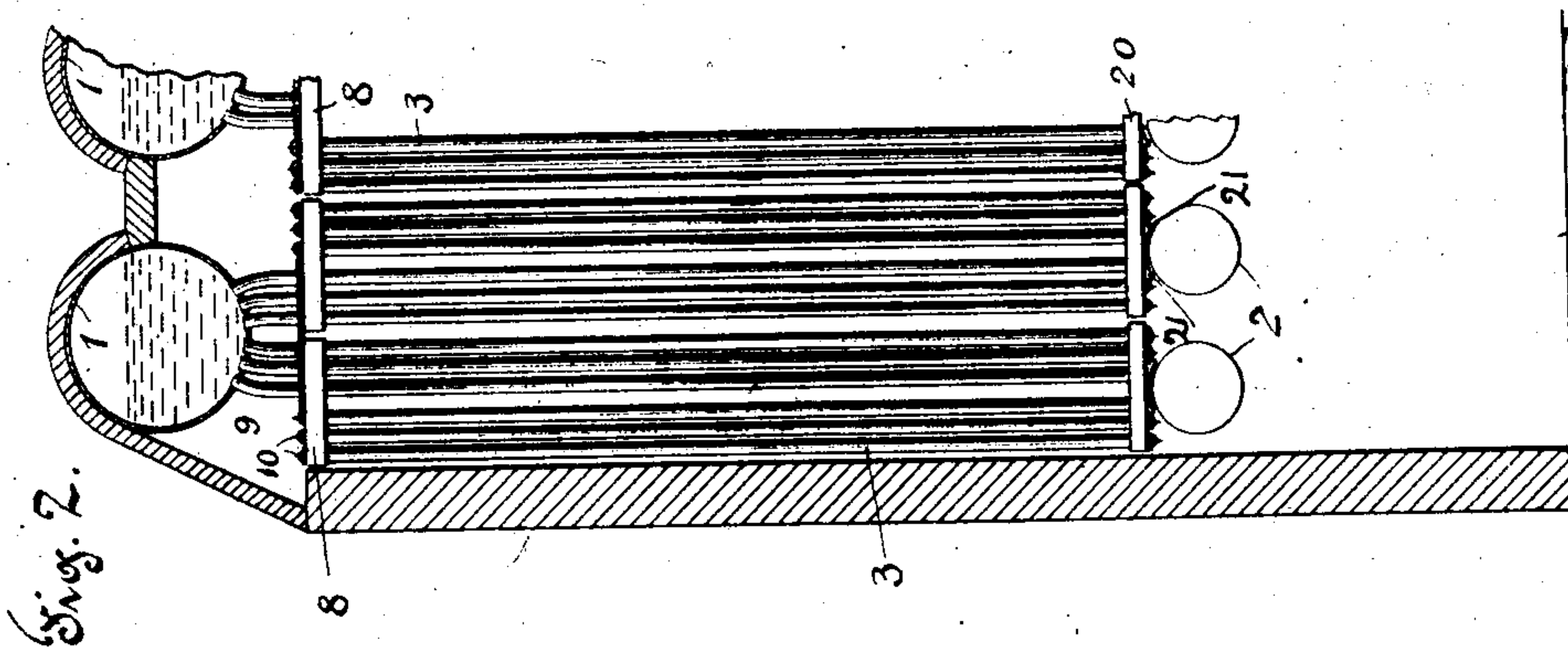
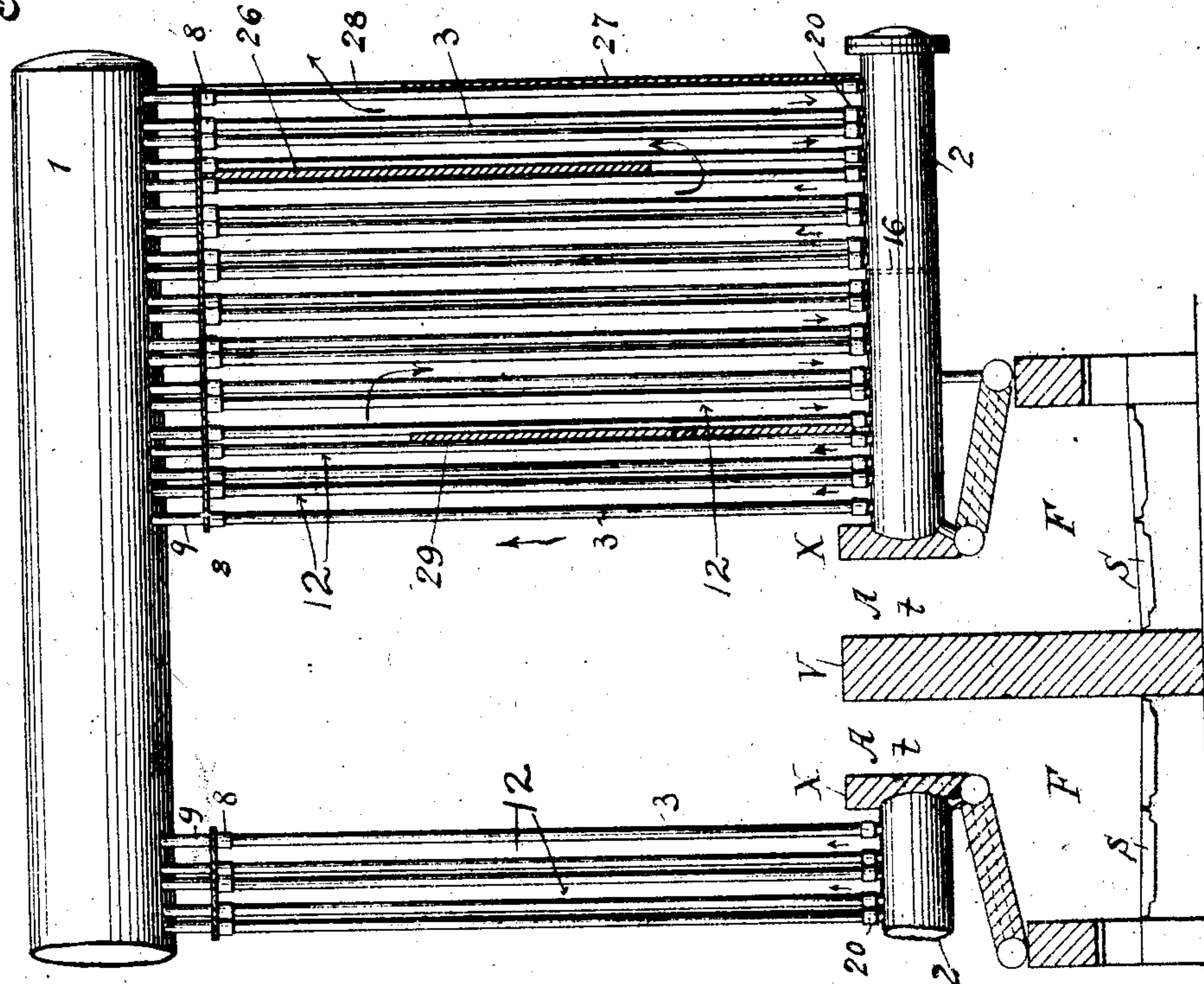


Fig. 1



Witnesses  
Charles Kanimann.  
Henry V. Brown

Inventor  
Frederick S. Potter  
By his Attorney  
Walter Brown

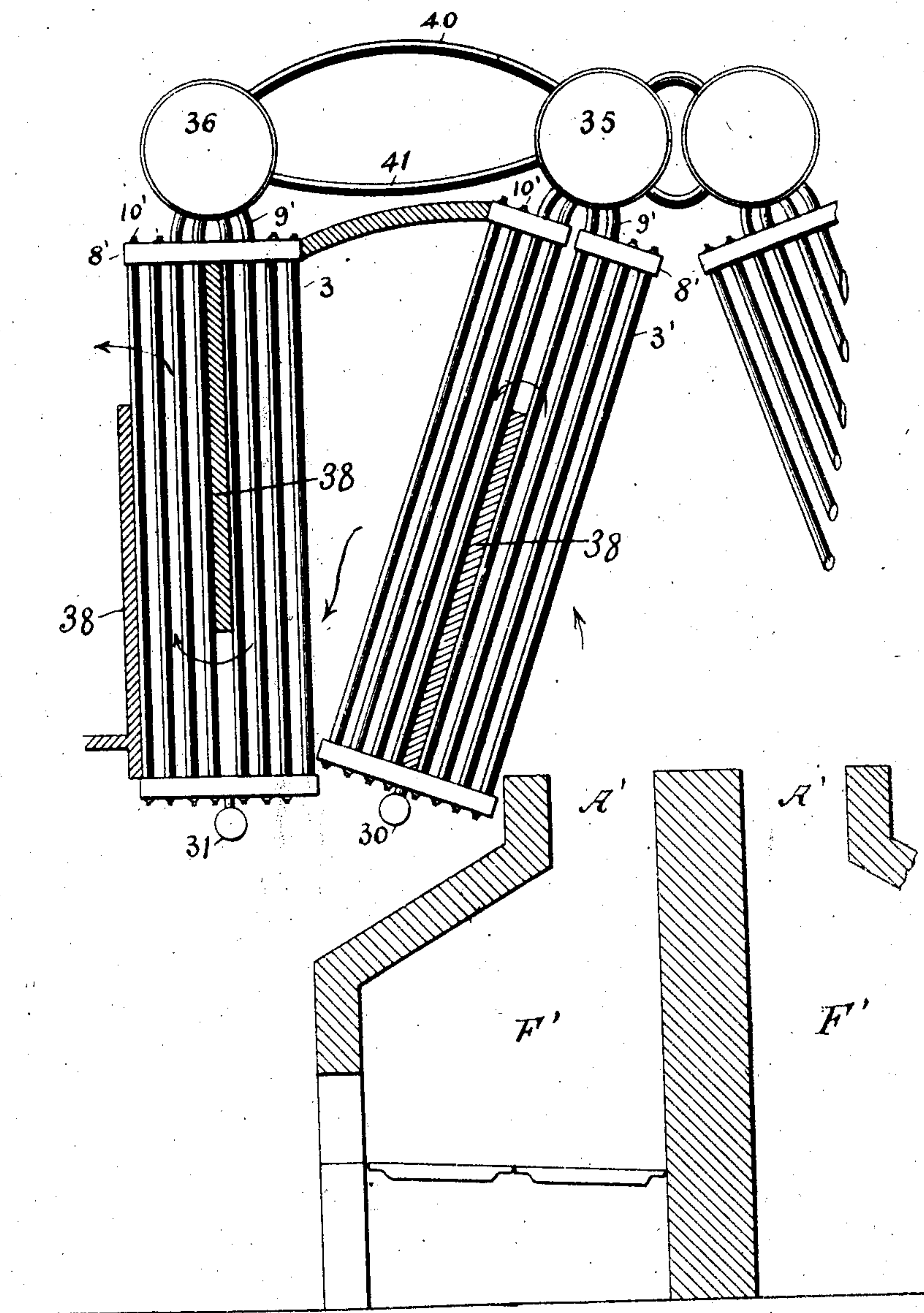
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2 SHEETS—SHEET 2.

Fig. 3.



Witnesses  
Charles Kanimann  
Henry V. Brown

Inventor  
Frederick D. Potter  
By his Attorney  
Walter Brown



# UNITED STATES PATENT OFFICE.

FREDERICK D. POTTER, OF LINDEN, NEW JERSEY.

## WATER-TUBE BOILER.

No. 834,640.

Specification of Letters Patent.

Patented Oct. 30, 1906.

Application filed November 11, 1905. Serial No. 286,803.

*To all whom it may concern:*

Be it known that I, FREDERICK D. POTTER, a citizen of the United States of America, and a resident of Linden, county of Union, State of New Jersey, have invented certain new and useful Improvements in Water-Tube Boilers, of which the following is a specification.

This invention relates to improvements in water-tube boilers.

The invention aims to furnish a construction having a high heating efficiency combined with ease in cleaning and repairing.

In water-tube boilers as heretofore built the efficiency has been decreased by the fact that the headers are so constructed and arranged that only one nipple can be used to connect a header with a drum, and as a plurality of water-tubes are connected with a single header the result has been the choking of the discharge from the headers, which impedes the circulation, and thereby lowers the heating efficiency of the boiler, and such has been the arrangement of the headers that it has heretofore been impracticable to remedy this difficulty. I, however, have overcome it by arranging the header in a plane parallel with a tangent plane of the drum, whereby I am able to connect a single header to the drum by a plurality of nipples, thereby affording sufficient passages for the ready flow of the greatest quantity of water necessary to attain the most efficient circulation. This arrangement of the headers with a plurality of nipples also allows of reaching a greater number of water-tubes for cleaning and repair from the drums than is practicable in the case of only a single connecting-nipple.

I also employ in my improved boiler a plurality of baffles so disposed as to enforce a compound circulation of the hot products of combustion in contact with the water-tubes, whereby the water will absorb the greatest practicable amount of heat from the said products of combustion. I also arrange the mud-drum to insure a positive circulation of the water through the tubes in accordance with the aforesaid circulation of the products of combustion around the tubes, so that the hottest flames come into contact with the hottest water, which condition I have ascertained to be that which promotes the highest boiler efficiency. I also greatly facilitate

the removal and renewal of the tubes by my manner of arrangement with greater spaces between them at certain intervals, along which spaces the tubes may be moved. I also provide means for insuring almost practically perfect smokeless combustion, whereby again I attain the highest boiler efficiency.

Referring to the drawings which accompany the specification to aid the description, Figure 1 is a broken longitudinal sectional elevation of an installation, but omitting much of the furnace-brickwork, since the same is not *per se* any part of my invention and is well known in the art. Fig. 2 is a broken vertical sectional elevation of the same. Fig. 3 is a broken vertical section and elevation of a modification in the manner of arranging the drums, baffles, and tubes.

Referring to Figs. 1 and 2, 1 is the steam and water drum; 2, the mud-drum; 3 3, water-tubes; 8, the upper and the lower header, in which opposite ends of said tubes 3 3 are respectively expanded, as is usual. Said upper header 8 is disposed in a plane which is substantially parallel with a tangent plane of the said drum, and the said header is connected with said drum by a plurality of nipples 9 9, which may be bent, if desired, to enter them radially into the said drum. Similarly the lower headers 20 are substantially parallel with a tangent plane of the mud-drum 2 and are connected therewith by plurality of short nipples 21. The said plurality of nipples, particularly connecting header 8 with drum 1, provides easy passage for the water from all the tubes 3 without choking the circulation and also renders access to a number of the water-tubes easy by way of the drum 1 and nipples 9, said drum 1 being provided, as usual, with suitable man-holes. Access to the remaining tubes is had by removing the caps 10. Said water-tubes 3 are arranged, as seen in Fig. 1, with relatively wide intervals 12 between each group of two. I might of course provide such wide intervals between every tube and the next tube or between groups of more than two tubes; but the arrangement shown is preferable in practice. These said intervals 12 provide passage-ways for the ready withdrawal of an injured tube and insertion of a new one and are a valuable feature of my invention.



I provide deflecting particles or baffles 26, 29, suitably supported, to cause the hot products of combustion from the furnace F to have a compound circulation in contact with the tubes 3 on their way to the smoke-hole 28 in the rear wall 27, said baffles being also so arranged that the hottest flames come into contact with the tubes containing the hottest water. The circulation in the said tubes is in the direction of the arrows, Fig. 1, and is further forced by the diaphragm 16 midway of the ends of the said mud-drum 2. Said diaphragm 16 has the further advantage of causing most of the mud and sediment to collect in the coldest end of the mud-drum.

I preferably install my boilers with two furnaces F F, having a common bridge-wall V and contracted throats *t t*. By this construction the said bridge-wall V and the furnace-walls X X become incandescent and produce practically perfect smokeless combustion of the fuel. While, however, I prefer such double furnaces and consider the same a valuable feature of my invention, I do not, of course, limit myself thereto, since my invention is intended to cover my arrangement of headers, nipples, drums, and baffles with other furnaces. It will of course be understood that there will be a wall and smoke-hole, respectively, similar to 27 and 28 to the left of Fig. 1, these parts being omitted from the drawing, which is broken away, as aforesaid.

In Fig. 3 I illustrate a modification of my invention wherein there are two mud-drums 30 31, respectively, having the effect of the single mud-drum 2 and diaphragm 16 of Fig. 1. It will be seen that in the said Fig. 3 I show the upper headers of the middle group of tubes as made in two separate parts, whereas the upper headers of the groups of tubes at the extreme left and extreme right of this figure are shown as made in one part, with which all the tubes of the group connect, and it is manifest that the headers in all the modifications can be made in either one or two parts, and it will also be seen on comparing Figs. 2 and 3 that the nipples or tubes which connect the headers with their respective steam-drums are arranged in pairs, so that the corresponding tubes of each pair are respectively equally distant from a line drawn through the center of the steam-drum and perpendicular to the plane of the header or headers. With such arrangement of mud-drums the headers 8', tubes 3', steam and water drums 35 36, and baffles 38 may be arranged as shown, said drums 35 36 being connected together by flow and return pipes 40 41, respectively. In this construction also there will preferably be a double furnace F' F', and the installation of drums, tubes, and baffles will be duplicated for the second furnace.

I claim—

1. In a boiler installation, the combination of a furnace, steam-drum and mud-drum, staggered baffles between said drums, headers respectively connected with said steam-drum and said mud-drum and having their major axes respectively substantially perpendicular to the major axes of the said steam-drum and mud-drum and substantially parallel to planes tangential to said steam-drum and mud-drum, and a plurality of nipples connecting said first-named headers with said steam-drum arranged in pairs, each nipple of the pair being at substantially the same distance from a line drawn through the axis of the said steam-drum perpendicular to the plane of said headers, substantially as described.

2. In a steam-boiler, the combination with a steam-drum and water-tubes of a mud-drum provided with a transverse partition adapted to return the sediment in one end of said mud-drum, substantially as described.

3. In a steam-boiler, the combination of a steam-drum, a mud-drum provided with a transverse partition adapted to retain the sediment in one end of said drum, headers connected with said mud-drum, headers and a plurality of nipples connecting said headers with said steam-drum and arranged in pairs, each nipple of the pair being at substantially the same distance from a line drawn through the axis of the steam-drum perpendicular to the plane of the headers, and tubes connecting said headers, substantially as described.

4. The combination of a furnace, a steam-drum, a header connected therewith, a mud-drum provided with a transverse partition adapted to aid in forcing a circulation in a certain direction, a header connected therewith, tubes connecting said headers, and staggered baffles arranged between said steam-drum and said mud-drum and between said tubes at points between the furnace and the smoke-flue and adapted to direct the hottest flames against the tubes containing the hottest water, substantially as described.

5. In a steam-boiler, the combination of a steam-drum, a plurality of headers separate from said drum and connected therewith by nipples and arranged substantially parallel with a plane tangential to said drum and at opposite sides of a plane through the axis of said drum substantially perpendicular to the plane of said headers, a mud-drum, a header separate therefrom and connected thereto by nipples and arranged substantially parallel with a plane tangential to said mud-drum, and water-tubes connecting said headers, substantially as described.

6. The combination in a steam-boiler, of a steam-drum, a mud-drum, headers respectively connected thereto extending to both



sides of a plane drawn through the axis of  
said steam-drum substantially perpendicu-  
larly to the planes of said headers, a plurality  
of nipples connecting said headers with their  
5 respective drums and a plurality of water-  
tubes connecting said headers, substantially  
as described.

Signed at New York city this 10th day of  
November, 1905.

FREDERICK D. POTTER.

Witnesses:

M. B. MEEHAN,  
WALTER N. HARRIS.