

C. E. WAKEMAN.
STEAM HEATER.

No. 492,174.

Patented Feb. 21, 1893.

Fig. 6.

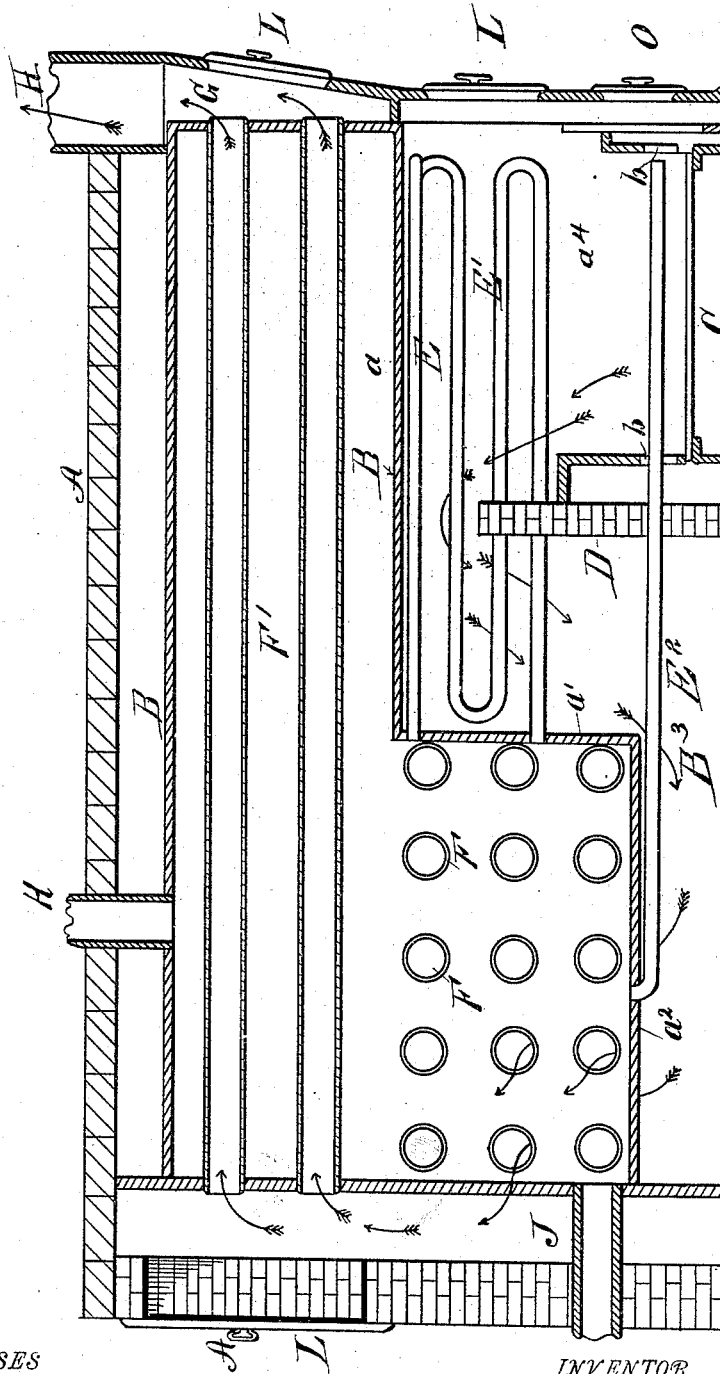


Fig. 1.

WITNESSES
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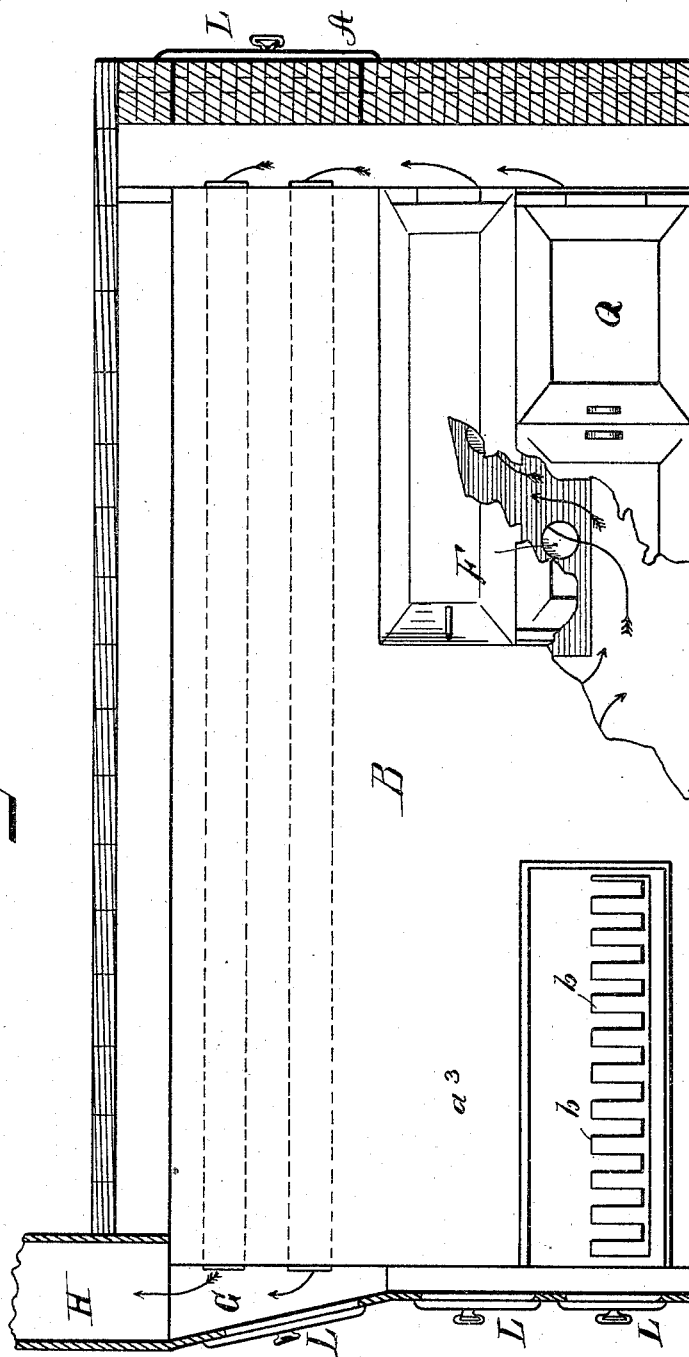
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Fig. 2.



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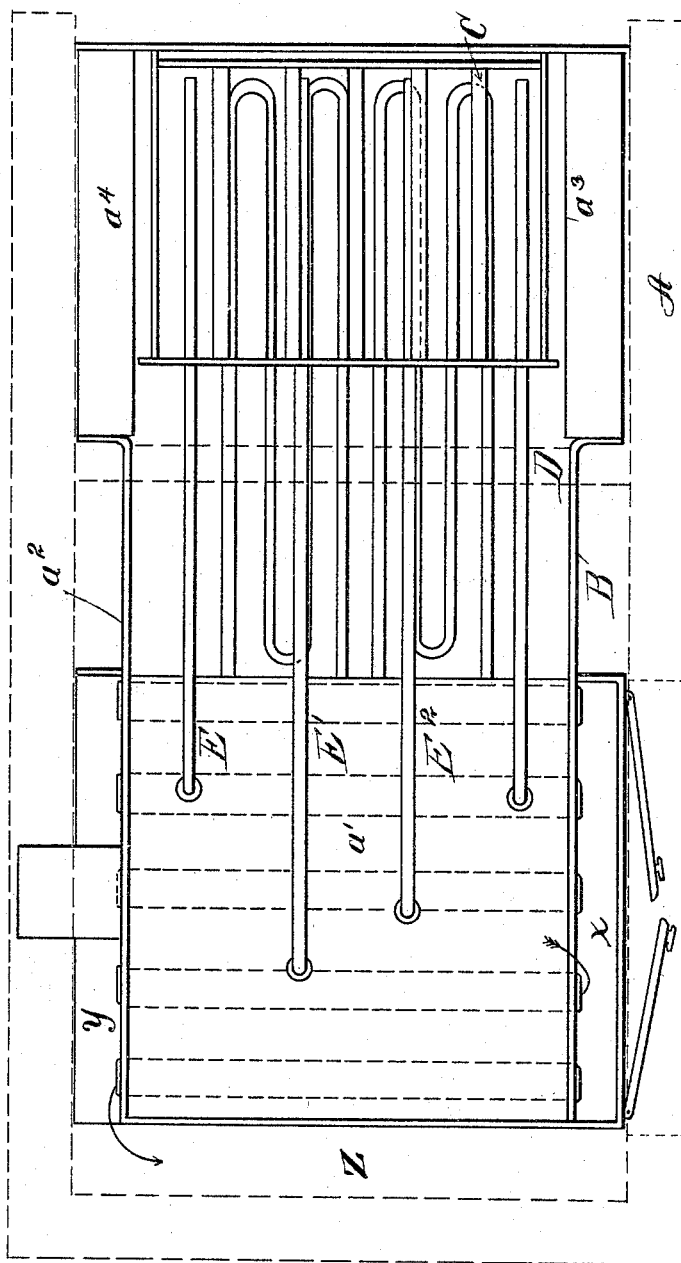
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Fig. 3.



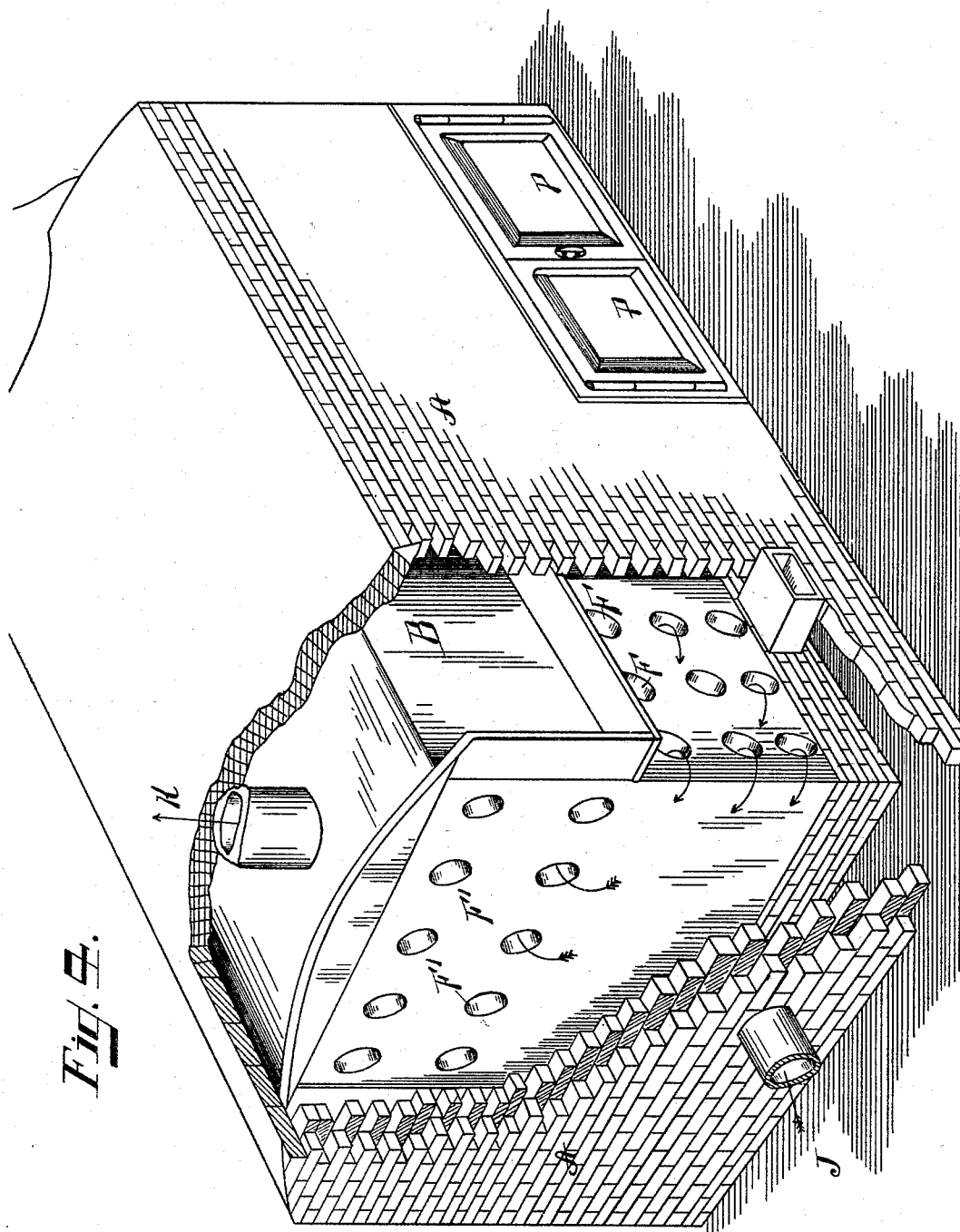
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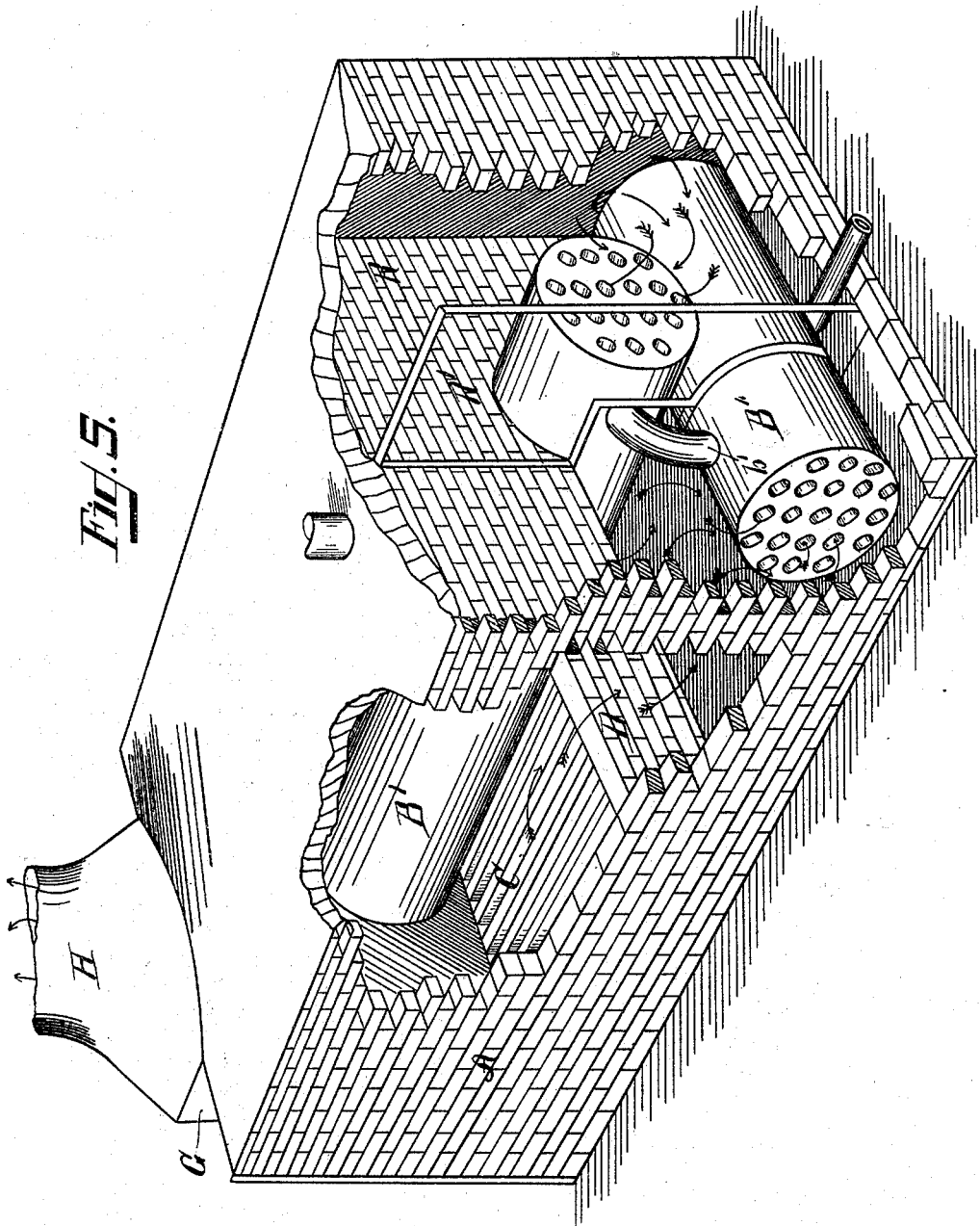
(No Model.)

5 Sheets—Sheet 5.

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UNITED STATES PATENT OFFICE.

CHARLES E. WAKEMAN, OF PONTIAC, MICHIGAN.

STEAM-HEATER.

SPECIFICATION forming part of Letters Patent No. 492,174, dated February 21, 1893.

Application filed January 13, 1892. Serial No. 417,979. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. WAKEMAN, a citizen of the United States, residing at Pontiac, county of Oakland, State of Michigan, have invented a certain new and useful Improvement in Water and Steam Heaters; and I 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates more especially to that class of apparatus known as water or steam heaters, and as a steam generator for power.

It consists in a special arrangement whereby more perfect and uniform combustion is secured, and the heating surface greatly increased in proportion to the volume of water than has been heretofore secured, thus resulting in greater economy of fuel, while at the same time it is simple and cheap to construct, and owing to its simplicity of construction and arrangement, is very easy to clean and keep in order.

In the drawings, Figure 1 represents a central longitudinally vertical section of my improved heater, showing the internal arrangement. Fig. 2 represents a right hand vertical view with the walls in which it should be set taken away, showing the outside construction and openings. Fig. 3 represents a bottom view thereof, showing the arrangement and construction. Fig. 4 represents a perspective view of the apparatus, with the setting walls partially broken away, partially showing the arrangement of the smoke chambers, and course of the heated gases, also facilities for cleaning the flues and air spaces. Fig. 5 represents a modified arrangement, employing the same principles. Fig. 6 shows a section of one of the tubes, as heretofore patented by me.

Similar letters refer to similar parts.

In the drawings, A represents the wall or casing surrounding the heating apparatus proper, and which, by its relation to the walls thereof, forms chambers for the heated gases as hereinafter more fully described in detail. This wall A is preferably constructed of non-conducting material, to render the loss of heat as little therefrom as possible.

B, represents the shell of the heater proper, which is shown in Figs. 1, 2, 3 and 4, to be rectangular in form, although it may be partially rectangular and partially cylindrical, or wholly cylindrical, or even composed of two cylinders as shown in Fig. 5, without departing from my invention. This shell should be of suitable materials and suitably constructed, and stayed by proper stay bolts and braces to resist any desired internal bursting strain.

C, represents a grate or fire place, having the grate bars of any desired or suitable pattern, and which may be arranged to be shaken or dumped in any desired manner; as there is nothing new or claimed in the details thereof except as hereinafter described, the non-essential details are omitted from the drawings.

D is a transverse bridge wall located just behind the grate with sufficient space between them to admit air to the rear end of the grate and clean the same as hereinafter described.

E, E', E², are water tubes located under the crown sheet *a*, and extending from the vertical fire sheet *a'*, also from the bottom *a²*, into the fire box, so that the top, sides and fire space over the grate are practically lined with them, and thus, as the water circulates therein, they afford a largely increased heating surface, facilitate circulation, and in a measure protect the crown sheet and sides from over heating. If desired, the sides of the fire box, shown at *a³*, *a⁴*, may be made double with stay bolts, thus making a water jacket like that of the usual form of locomotive boilers, which jacket however would not extend down to and inclose the grate, but would only reach to the openings *b, b*, which are cut into the sheet inclosing the grate.

F, F, are transverse flues, through the lower rear portion of the heater, extending from side to side, and through which the heated gases are conducted as hereinafter described.

F', F', are longitudinal flues from front to rear, in the upper portion of the heater for the same purpose.

G is the hood and smoke box, covering the flues F', F', and openings into the smoke stack H.

J is the inlet for feed or return water, while K represents the steam pipe connection with radiators or other suitable steam apparatus.

L, L, represent openings for feeding fuel cleaning flues and combustion chambers, which openings are secured by suitable doors.

The construction of the fire box, aside from the grate, is peculiar, and is intended to secure circumferential oblique side draft below the walls thereof; and above the grate around the four sides of the grate, instead of simply in front as is the case with ordinary grates of this class, and thus secure perfect combustion at those parts where the fire is usually more or less dead. This construction also permits, through suitable openings, the more perfect clearing of the grate of ashes and clinkers, as it is accessible at all of its sides. These results are attained by not bringing the walls, a^2 , a^4 , of the fire box down to the grate, but by leaving a suitable interval which may be varied in size if desired. This interval on all sides contains, projecting downward from those walls, fingers which approach, but do not quite reach the grate, but which serve to hold the coal therein and yet permit clinkers and ashes to be cleared therefrom, through the various openings, viz., the ash pit doors O, the side doors P, the rear of the grate being reached through the rear ends of the openings on the sides which extend back far enough to permit observation of that portion of the grate and fire box and to reach it thereby. It is obvious that, as the draft openings b connect with the whole space around and under the grate, the draft can by suitable management of the fire be equalized through all portions of the bed of coal, and thus a very clear and even combustion is secured.

The walls A are set a short distance from the shell B, as shown in Fig. 1 at the end. In Fig. 4, this is more particularly shown, and especially a portion of the resulting chambers through which the heated gases are compelled to circulate.

In Fig. 1 it will be seen that the heated gases as they rise from the burning fuel strike the water tubes E, E', and crown sheet a , directly over the fire box; they are then deflected over the bridge wall D, until they strike the vertical sheet a' . From thence they are deflected underneath the rear portion of the heater at B³. The left hand slide being closed off by the foundation wall A², as shown in Fig. 3, the heated gases are compelled to deflect to the right into the chamber X, from whence they pass into the transverse flues F, F, through the lower portion of the heater to the chamber Y on the left side. This chamber is closed at all points, except the rear, where it opens into the transverse chamber Z, extending upwardly to inclose the longitudinal flues, F', F'; the heated products of combustion are then compelled to traverse the chambers mentioned to and through the flues F' F' to the smoke box G, created by the hood N at the other or front side of the heater; from thence they may be conducted directly to the chimney, or may be conducted backward over the

top of the heater to the rear end, and from thence to a suitable exit.

The direction of the gases is shown more clearly by arrows.

Suitable attachments are provided whereby the various chambers may be inspected and cleaned. These are shown as doors in the chambers at L, L. Through that door at Q, the chambers underneath the rear may be cleaned; the cross flues F may be cleaned through the side doors; while the front doors permit the cleaning of the longitudinal flues.

The lower water pipes running into the fire box are preferably constructed as shown in the patent of September 9, 1890, No. 435,989.

Suitable attachments are applied to permit the inlet of feed water at J, an outlet of the steam K, also the proper water and pressure gages and safety valves, about which there is nothing new, and hence not illustrated or described.

In Fig. 5 I have shown the arrangement when cylindrical heaters are used and combined upon the same principles. It consists of a longitudinal cylindrical boiler B', and a transverse cylindrical boiler B², arranged so that the transverse boiler is immediately under one end of a longitudinal boiler, having under the other end a grate and fire box, constructed and set substantially like that previously described, and which therefore does not need further illustration. A similar bridge wall shown at D, is also interposed between the grate and the transverse boiler, over which the heated products of combustion are caused to pass, thus compelling them to strongly impinge against the under side of the boiler, and against the side of boiler B². The two boilers are connected at the junction by large curved pipes b' , by which the contents can freely circulate. The heating chamber between and formed by the bridge wall and the lower boiler is cut off from the left end of the transverse boiler by the internal cross partition R, extending downward and closing in the side of boiler B². A longitudinal, vertical partition is also constructed, shown as transparent in Fig. 5 at R', dividing the end chamber at that point so that there is no communication between the two end chambers inclosing the ends respectively of the transverse boiler B², except through flues provided therein. This partition is set against the left side of the boiler B' so that the left hand chamber communicates with flues F, constructed longitudinally in boiler B², whereby the heated gases passing from the fire box over the bridge wall are diverted through the flues of boiler B², thence into the chamber at the right, thence through the flues and boiler B' to the smoke box, at the front end of boiler B, and thence to the chimney. This form permits a slight variation from the mode of operation secured by the square heater, in that it permits boiler B' to be wholly inclosed at its front end in the combustion chamber, and for this reason the drawing is purposely exagger-

ated in showing the sitting so that the inclosure can be clearly seen, the chambers being relatively much larger than required for the boiler size. Shown with this form, the proper inlet or feed pipes, outlet pipes, gages and valves, are provided as well as the doors for observation and cleaning.

In a heater of this kind, one of the advantages secured by constructing is the facility with which every part can be examined, as by opening the doors, they may be observed from end to end, and all the work is simple in construction.

The mode of operation is clear from the description already given. In practice in using the device as a steam heater, it is usual to fill with water to cover the crown sheet one or two inches in depth, or the boiler B' about half full to protect the sheets from the direct action of the fire. In this manner the return flues serve to superheat the steam and thus dry it, which thus yields better results in the registers to which it is sent, or for power purposes, than otherwise would be the case.

What I claim as my invention is—

1. In a water heater, the combination of a fire box and its accessories located at one end of said heater, a transverse bridge wall located transversely to and in the line of the draft, separated from said fire box at its lower portion, the upper portion of said fire box being extended to and joining said bridge wall and having a space between the upper portion of said bridge wall and the lower shell of the heater, a transverse chamber on the opposite side of said bridge wall and between it and

a dependent water leg, said chamber communicating with a side chamber adjacent to and upon one side of said water leg, transverse flues through said water leg to a chamber upon the opposite side thereof, a communicating chamber, and return flues longitudinally through the shell, substantially as specified.

2. In a water heater, the combination of a fire box and accessories located at one end thereof, a bridge wall located in the line of draft and transversely thereto, the lower portion of which is separated from said fire box by an internal space and having a smoke channel between the upper portion of said bridge wall and the shell of the heater, a transverse chamber upon the opposite side of said bridge wall and between it, and a dependent water leg attached to said heater, water tubes communicating with said water leg and forming nestings in and around said fire box, traversing the chamber upon the opposite side of said bridge wall and the said bridge wall, communicating flues transversely through said water leg with the side chambers, one of which communicates with the chamber adjacent to said bridge wall, and the other of which communicates with a chamber at the ends of said water heater opposite the fire box, and with return flues through said water heater, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

CHARLES E. WAKEMAN.

Witnesses:

R. A. PARKER,
MARION A. REEVE.