

(No Model.)

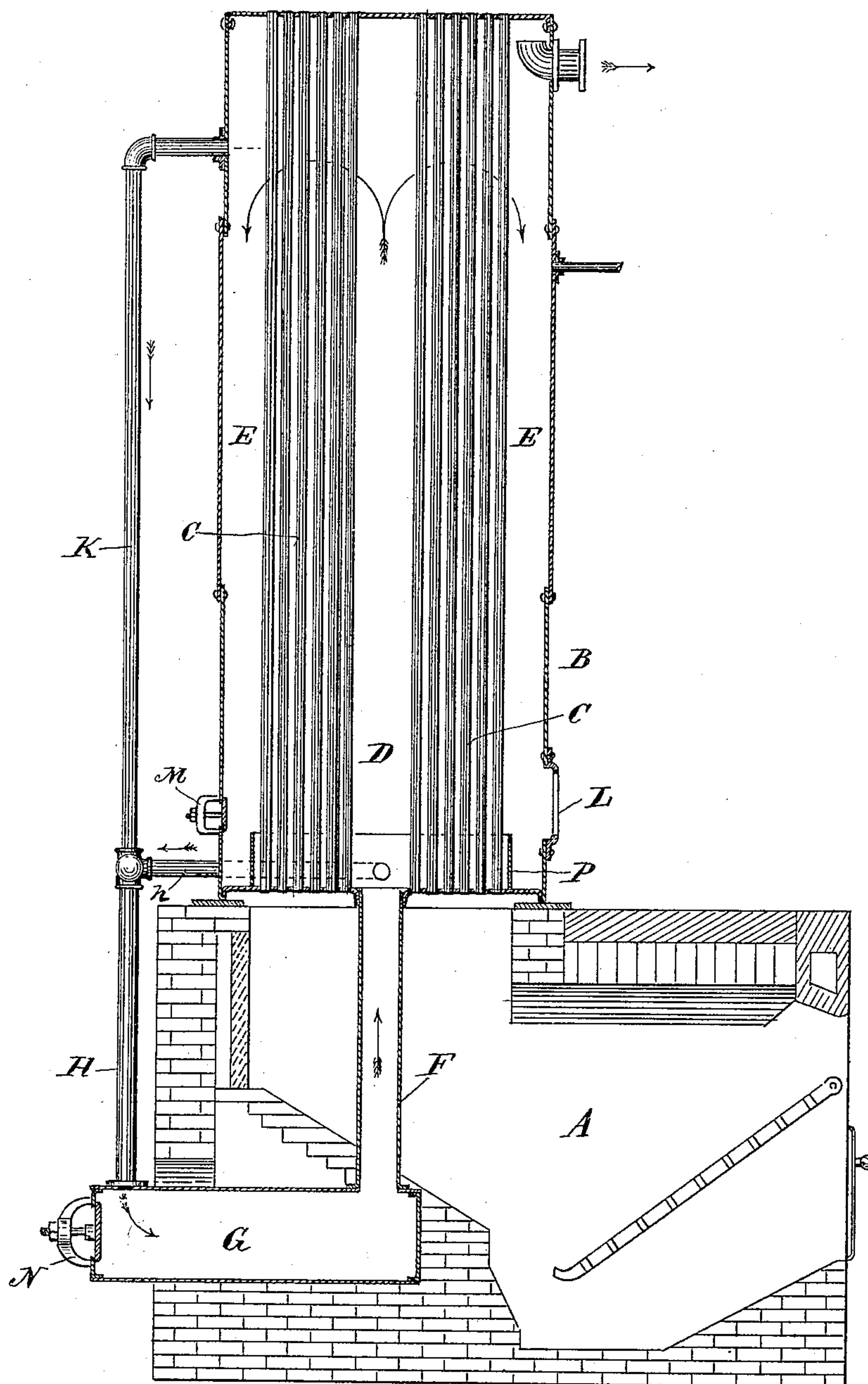
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C. F. BAKER.
VERTICAL BOILER.

No. 459,776.

Patented Sept. 22, 1891.

Fig. 1.



Witnesses
A. H. Opsahl.
Frank D. Merchant

Inventor.
Charles F. Baker
By his Attorney.
Jas. F. Williamson

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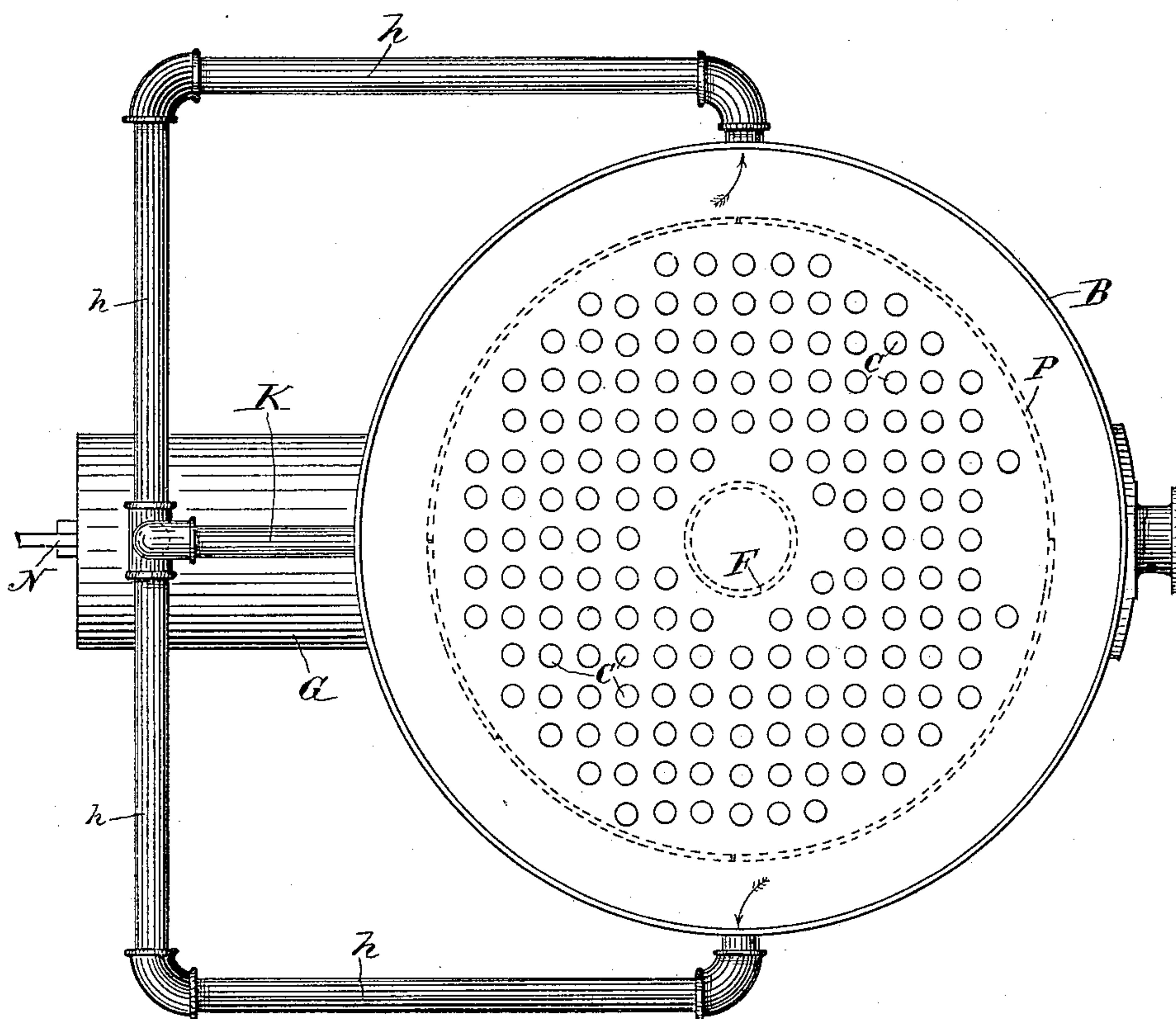
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Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES F. BAKER, OF MINNEAPOLIS, MINNESOTA.

VERTICAL BOILER.

SPECIFICATION forming part of Letters Patent No. 459,776, dated September 22, 1891.

Application filed February 12, 1891. Serial No. 381,125. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. BAKER, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Vertical Boilers; and I do hereby 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 appertains to make and use the same.

My invention has for its object to provide an efficient and durable vertical boiler. To this end I arrange the flues around a central space, placing the flues substantially in right lines in two directions, so as to leave clearance-spaces between the lines of flues, which will permit the passage of a cleaning-scraper in both directions. Between the flues and the boiler-shell is left sufficient space to permit the entrance of a man for cleaning the boiler, and which also serves as the down-draft chamber for the water. Continuous with the central space is a water-leg passing through the fire-box of the furnace to a mud-drum located below the same. Outside circulating-pipes connect the boiler with the mud-drum. The outflow-pipes are connected to the boiler near its lower end and the skimming-pipe taps the boiler on the water-line and is connected by a union with the outside circulating-pipe. Surrounding the whole or a part of the flues at the lower end of the boiler is placed an annular diaphragm or partition, the function of which is to assist in directing the circulation, so as to more perfectly separate the rising from the descending column. Access is had to this chamber by a man-hole on one side and a hand-hole on the other. The steam-pipe taps the boiler at its upper end, so as to draw off the hottest steam, and the feed-pipe on the side below the water-line. The mud-drum is provided at its outer end with the man-hole opening and stop-plate of the ordinary construction for access to clean the same. The furnace is of the ordinary construction, of such a kind as to be adapted to the use of a mechanical stoker, a detailed description of which is not deemed necessary for the purpose of this application.

The construction of my boiler is shown in

the accompanying drawings, wherein like letters refer to like parts throughout.

Figure 1 is a vertical longitudinal section through the boiler and furnace, and Fig. 2 is a plan view of the boiler.

A is the furnace.

B is the boiler-shell.

C are the flues.

D is the central space.

E is the clearance-space between the flues and the shell.

F is the water-leg.

G is the mud-drum.

H h h are the outside circulating-pipes.

K is the skimmer-pipe.

L is the man-hole to the boiler, and M is the hand-hole to the same.

N is the man-hole and cover to the mud-drum.

P is the annular vertical partition or diaphragm.

The operation is as follows: The ascending column is upward from the water-leg among and around the flues and the descending column is downward and along the shell of the boiler in the clearance-chamber E, thence through the circulating-pipes to the mud-drum, where the sediment is deposited. The water-leg and the lower end of the boiler and flues being extremely hot, the circulation at this point is very rapid, and the agitation of the water will carry upward with it all foreign materials which were not left in the mud-drum, and effectually prevent the lower end of the boiler from burning the surface, being kept always perfectly clean, so as to give a water covering. If any deposit is made among the tubes on the lower end of the boiler, their arrangement with clearance-spaces enables the same to be readily removed. Hence the boiler will last for a comparatively long time. The skimmer-pipe operates in the ordinary way to carry off the scum from the top of the water.

By actual usage I have found this boiler to have a very high efficiency in evaporation and to be very durable.

The annular partition P, resting, as it does, on the lower head of the boiler directly outside the tubes, constitutes a very important improvement. Actual experience has demonstrated that by the use of this annular parti-

tion or diaphragm a boiler may be used for an indefinite period without any deposit or scale whatever on the lower boiler-head among the tubes inside the diaphragm. The reason for this has already been stated—viz., that the in circulation from the descending column is entirely prevented and the up circulation from the ascending column is so strong that it carries everything with it. In other words, the circulation is so divided by the said partition that the sediment is carried outward with the descending current into the mud-drum, and any deposit which may be made inside the boiler-shell will fall outside the partition P. The diameter of the pipe H is relatively large, being greater than the sum of the pipes K, h , and h , in order to avoid violent agitation in the mud-drum.

It will be observed that one important result gained with this arrangement of the boiler, mud-drum, and circulating-pipes is to dispense with a water-leg surrounding the fire-box, enabling the use of a brick casing instead. This is a very great gain. A water-leg surrounding the fire-box is a check and detriment to combustion, in that the water absorbs the heat with such rapidity as to prevent sufficiently-high temperature in the fire-box to produce complete combustion. On the other hand, the use of brick or fire-clay concentrates the heat, as it is well known, within the fire-box, affording the best results of combustion. Another disadvantage of the water-leg surrounding the fire-box is the necessary use of stay-bolts and the danger of collapse, all of which is obviated with my construction.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination, with a furnace, of a mud-drum having a water-leg extending through the fire-box, a vertical boiler located above the drum, having its flues arranged around a central up-current chamber continuous with the water-leg and provided with a clearance and down-current chamber between the flues and the shell of the boiler, and out-

side circulating-pipes; substantially as described.

2. The combination, with a furnace, of a vertical boiler, a mud-drum located below the fire-box, a water-leg extending from the drum through the fire-box to the boiler, and outside circulating-pipes from the boiler to the drum.

3. The combination, with a furnace, of a mud-drum having a water-leg extending through the fire-box, a vertical boiler located above the drum, having its flues arranged around a central up-current space or chamber continuous with the water-leg and provided with a clearance and down-current chamber between the flues and the shell of the boilers, outside circulating-pipes, and an annular partition resting on the lower boiler-head and inclosing the flues for dividing the up-current from the down-current columns of circulation, substantially as described.

4. The combination, with a mud-drum, of a vertical boiler having its flues concentric with the water-leg of the drum, an outflow-pipe from the boiler to the drum, and an annular partition or diaphragm resting on the lower head of the boiler and inclosing the flues for dividing the ascending from the descending currents, substantially as described.

5. The combination, with the furnace A, of the shell B, the flues C, arranged around a central space D and with the clearance-chamber E between the flues and the shell of the boiler, the mud-drum G, with the vertical water-leg F passing through the fire-box continuous with the central chamber D, the outside circulating-pipes H h K, and the annular partition P, located on the lower head of the boiler and inclosing the flues, all arranged and operating substantially as described and shown.

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

CHARLES F. BAKER.

Witnesses:

JAS. F. WILLIAMSON,
EMMA F. ELMORE.