

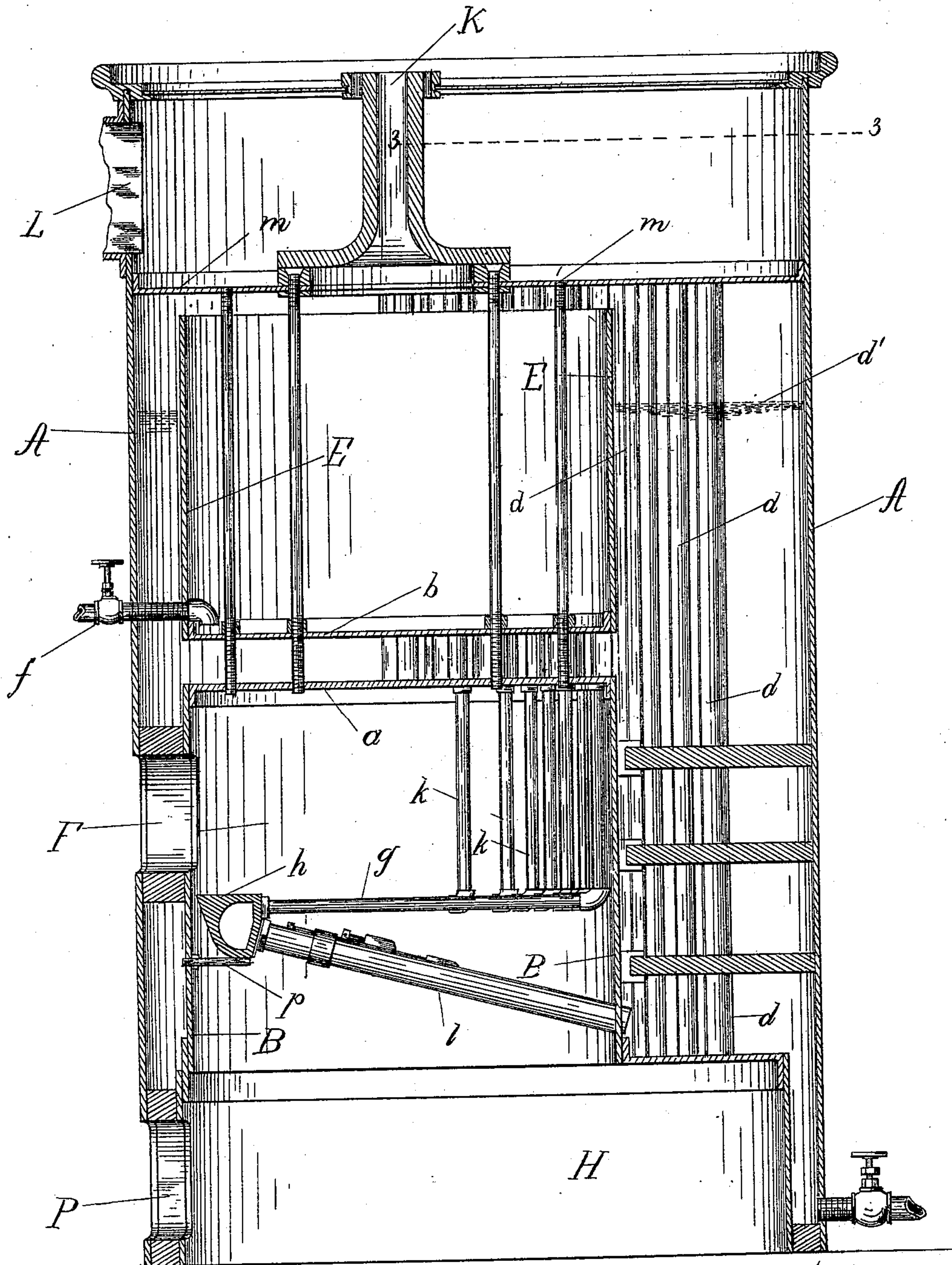
(No Model.)

4 Sheets—Sheet 1.

E. B. PARKHURST.
STEAM BOILER.

No. 557,424.

Patented Mar. 31, 1896.



WITNESSES—

Arthur F. Randall.

Robert Wallace.

FIG. 1.

INVENTOR—

Edward B. Parkhurst,

by
Machood Calver Randall
his attys

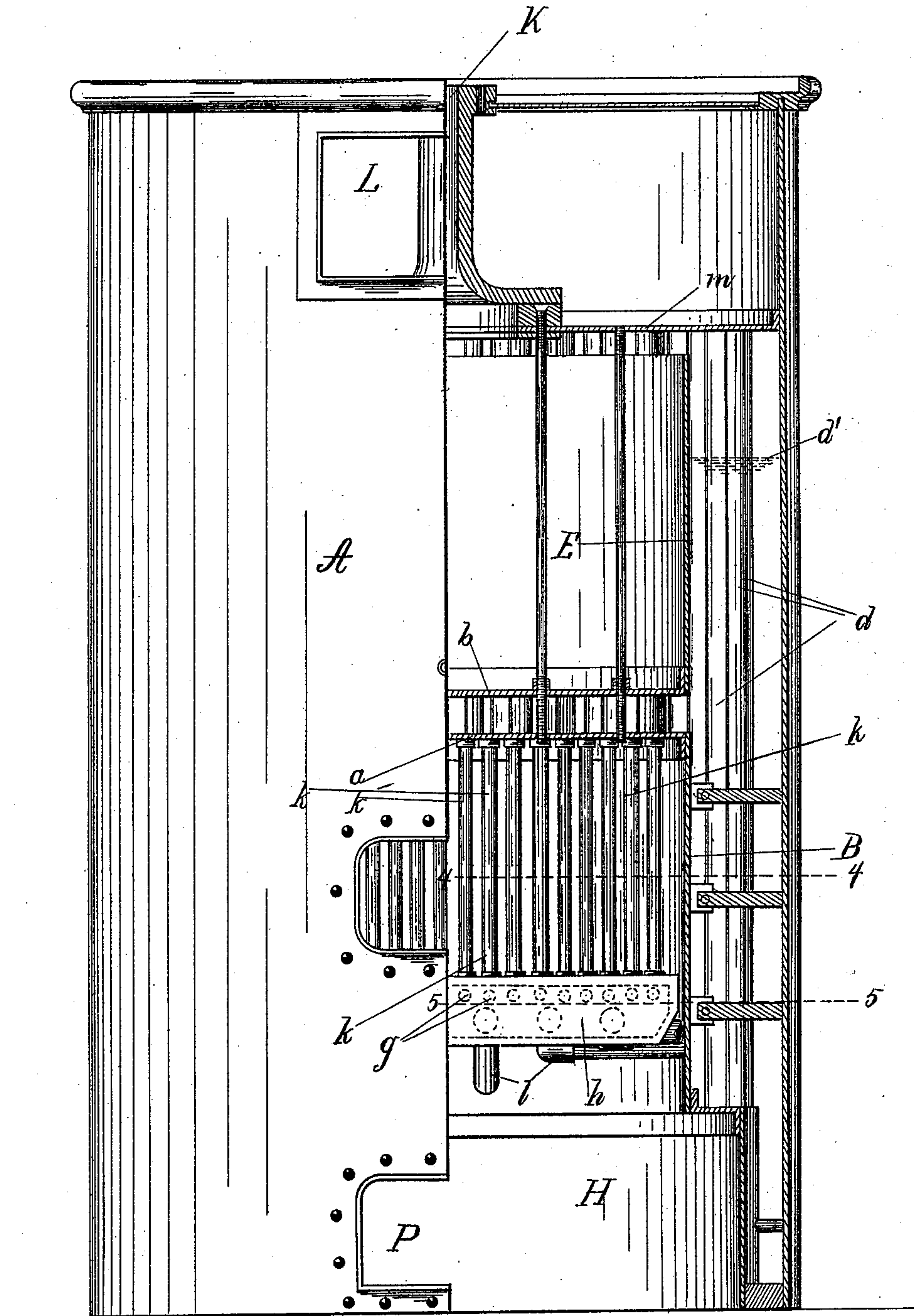
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WITNESSES—
Arthur F. Randall.
Robert Wallace.

FIG. 2.

INVENTOR
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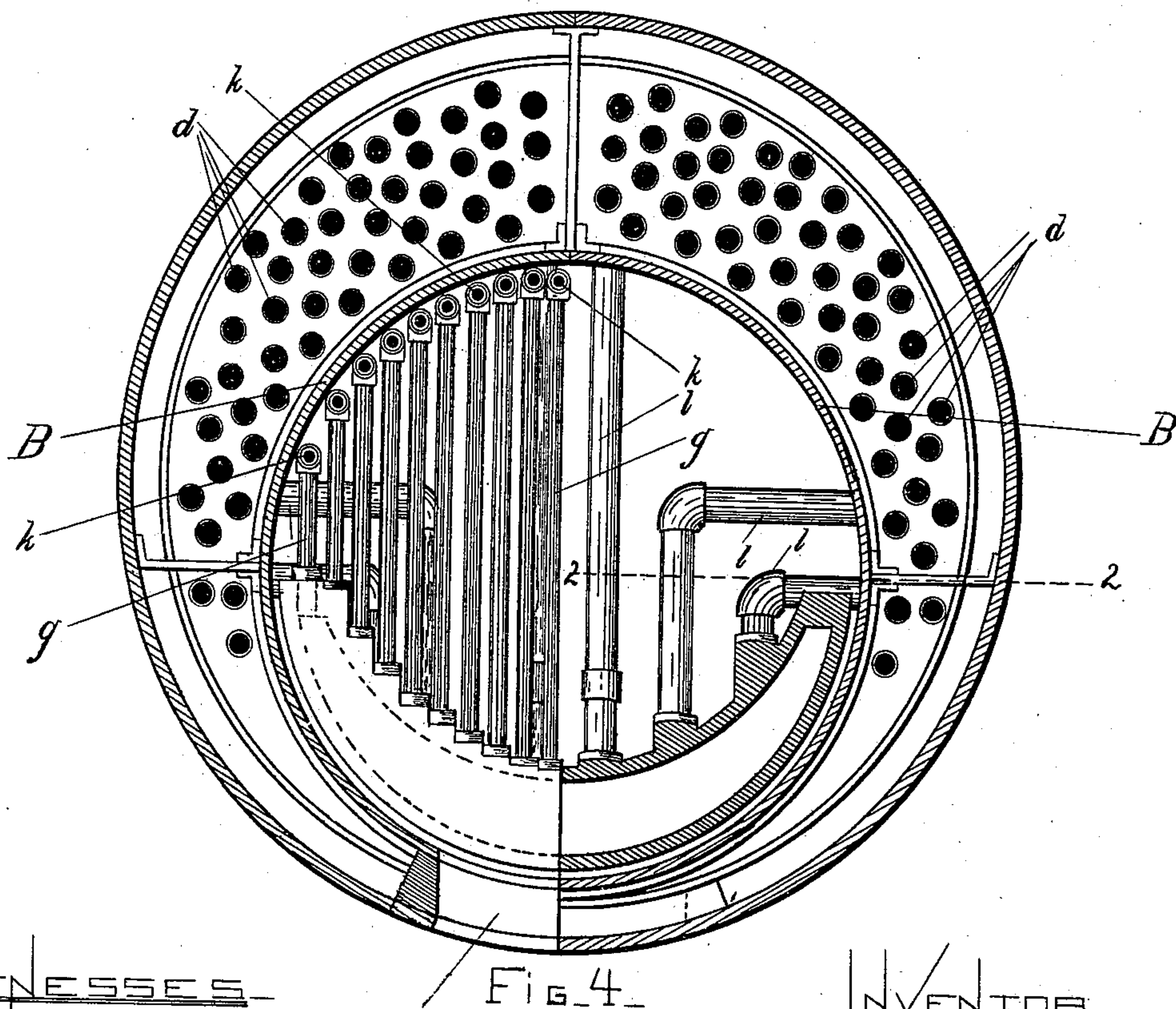
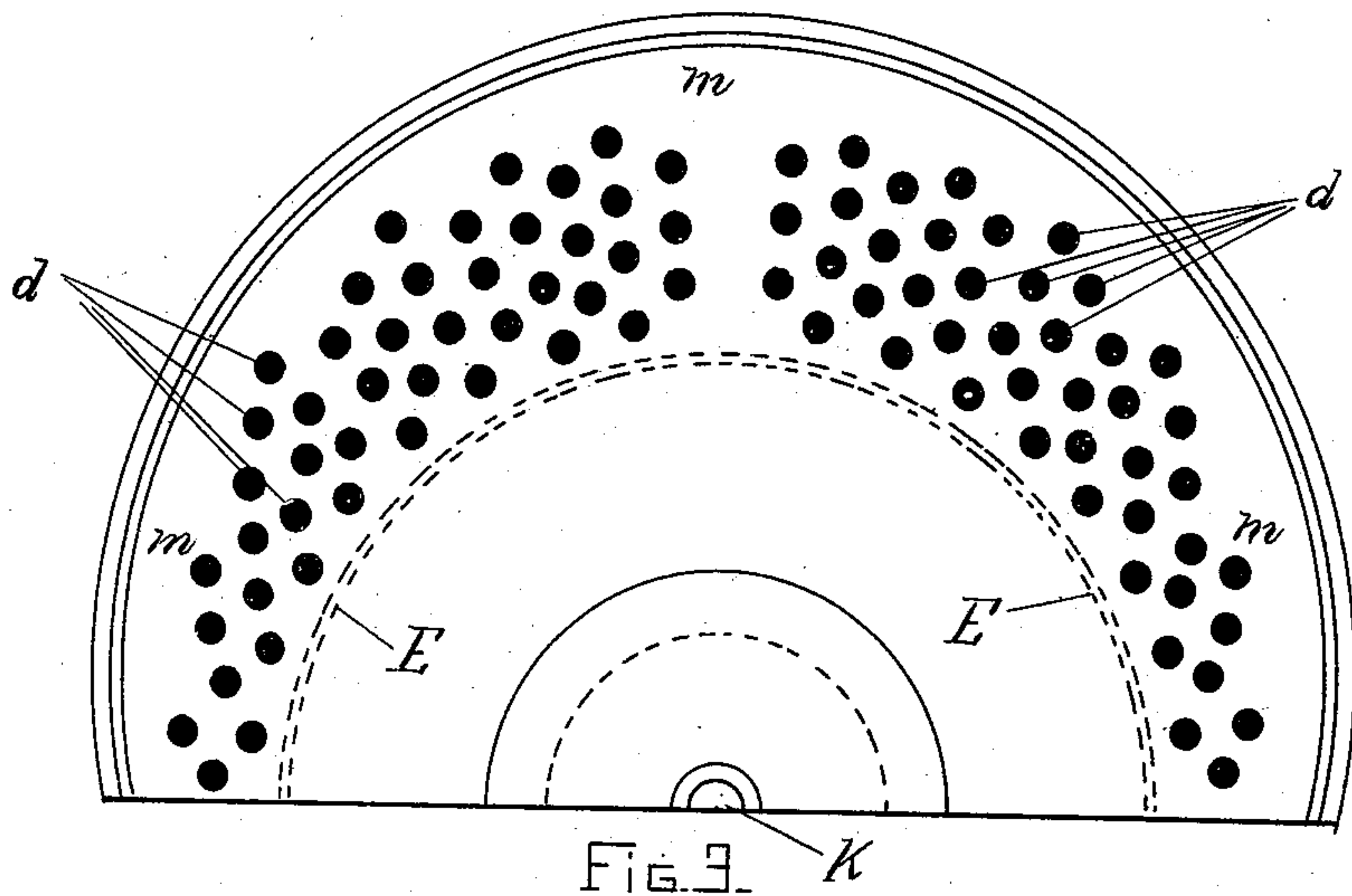
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WITNESSES—

Arthur F. Raudall.
Robert Wallace.

FIG. 4.

INVENTOR—

Edward B. Parkhurst,
by
Mabel C. Calver & Raudall
his attys

(No Model.)

4 Sheets—Sheet 4.

E. B. PARKHURST.
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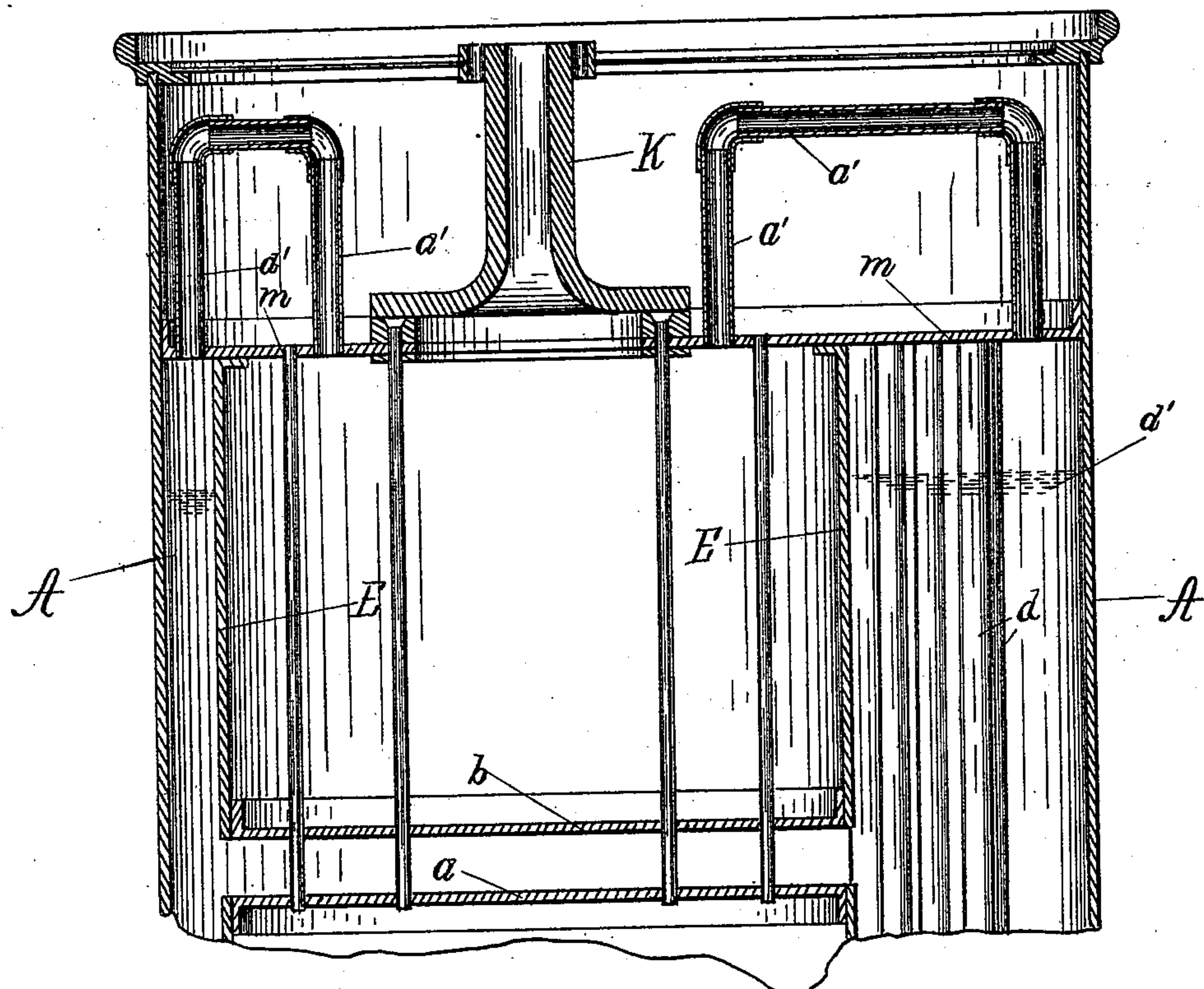


FIG. 5.

WITNESSES
Arthur F. Randall
Robert Wallace.

INVENTOR
Edward B. Parkhurst,
by
Macedon Calder & Randall
his Attys.

UNITED STATES PATENT OFFICE.

EDWARD B. PARKHURST, OF WOBURN, MASSACHUSETTS, ASSIGNOR TO THE
COMPLETE COMBUSTION COMPANY, OF BOSTON, MASSACHUSETTS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 557,424, dated March 31, 1896.

Application filed January 16, 1892. Serial No. 418,280. (No model.)

To all whom it may concern:

Be it known that I, EDWARD B. PARKHURST, a citizen of the United States, residing at Woburn, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification, reference being had therein to the accompanying drawings.

10 Downdraft upright furnace-boilers as at present constructed are inefficient, owing to the fact that the space above the crown-sheet is occupied by a mass of water which is not traversed by flues and which cannot be rapidly or efficiently heated. This difficulty has hitherto prevented, so far as known to me, the construction of downdraft upright furnace-boilers of large size.

20 My invention has for its object to produce a downdraft upright boiler-furnace which may be built in any size and which shall obviate this difficulty; and it consists, essentially, in displacing the greater portion of the mass of water over the crown-sheet by means of a steam-chamber, as also in the construction and arrangement of the parts to efficiently embody this idea in a practical form, all as hereinafter more particularly set forth, and the novel features of which are pointed out in the claims which are appended hereto and made a part hereof.

35 I have shown my invention in the best form now known to me in the accompanying drawings, to which reference will be made in the following description, and in which—

40 Figure 1 is a central vertical section of a furnace-boiler embodying my invention, said section being on a plane passing from front to rear of said furnace-boiler. Fig. 2 is a front elevation, one-half in section, said section being on line 2 2, Fig. 4. Fig. 3 is a sectional view of the rear half of the boiler on line 3 3, Fig. 1. Fig. 4 is a transverse section, the left half being on line 4 4, Fig. 2, and the right half being on line 5 5, Fig. 2. Fig. 5 shows a modified form of construction of the steam-chamber.

50 A represents the outer shell of the boiler; B, the furnace-shell, which is located in the lower front part of the boiler and is of the shape shown in Figs. 1 and 4. There is prefer-

ably a water-space between the furnace-shell and boiler-shell, as shown. At the rear and sides of the furnace-shell the ash-pit and combustion-chamber H extend outward toward the boiler-shell—that is, the combustion-chamber is larger in transverse area than is the fire-chamber.

60 Extending vertically from the combustion-chamber and outside of the fire-chamber are placed a series of vertical flues *d*, through which the draft passes and which extend upwardly to the smoke-chamber at the top of the boiler-shell. The uptake is shown at L. The space above the crown-sheet *a* is occupied in large part by a steam-chamber, the greater part of the water which would ordinarily fill this space being displaced by a chamber obtained by means of the vessel or drum E, which is rigidly secured in place in the well-known manner. The transverse section of the said chamber is preferably similar to the transverse section of the fire-chamber—that is, the vessel E in the construction shown in the accompanying drawings is cylindrical. 75 Between the sides of said vessel or drum and the shell A is left a water-space, through which pass the flues *d*, the latter being exterior to and surrounding or partially surrounding the said vessel or drum. The bottom *b* of the vessel E is separated from the crown-sheet *a* by a water-space which is of such size that the water occupying it may be readily heated from the crown-sheet.

85 The top of the vessel E is open and is preferably near the tube-sheet *m* and is thus a considerable distance above the water-line *d'* of the boiler. The steam-outlet pipe K is preferably placed centrally over the vessel E and passes up through the smoke-chamber, as shown, Fig. 1. The steam which is formed passes up over the sides of the vessel E and fills the chamber within said vessel. In this way a large steam space or chamber is obtained which is desirable. An outlet-pipe *f*, supplied with a suitable stop-cock, is provided from the steam-chamber, so that should water accumulate therein it may be readily withdrawn. As will be clear, the size of the vessel E, and consequently of the steam-chamber, may be varied, so that a greater or less amount of the water which would otherwise 100

occupy the space of the steam-chamber may be displaced. I prefer, however, for the best results, that the steam-chamber E should be of about the same transverse area as the fire-chamber.

At Fig. 5 I have shown a slightly different method of constructing the steam-chamber and connecting it with the steam-space proper of the boiler. In this form of construction the walls of the steam-chamber are carried up to the tube-sheet and are secured thereto. For the purpose of connecting the steam-chamber with the steam-space of the boiler pipes *a'* are employed, which are preferably located in the smoke-chamber and enter the steam-space near the boiler-shell. I do not, however, in this form of construction desire to limit myself to any particular form of connection between the steam-chamber and the steam-space. It will be obviously necessary, however, to have the connecting-pipes which connect the steam-chamber and the steam-space of as large or slightly larger capacity than the steam-outlet pipe K.

My improved boiler is especially adapted for use with a downdraft-furnace employing hollow grate-bars provided with proper connections by means of which a circulation of the water in the boiler may be obtained. The precise form of the furnace is, however, immaterial to my present invention, as is also the form and construction of the water-circulating pipes and grate-bars. I have shown in the accompanying drawings an improved form of water-grate bars and connections, which I intend to make the subject of a separate application for Letters Patent, and I do not deem it necessary therefore to refer to these parts at length in this specification. The grate-bars shown at *g* consist of tubes which at their front ends enter a water-box *h* and at their rear ends are connected by means of vertical pipes *k* with the water-space above the crown-sheet. The water-box is curved to fit the cylindrical furnace-shell, as shown, Fig. 4, and it rests upon and is partially supported by pins *p*. Said water-box is provided with a number of supply-pipes *l*, by means of which the cold water from the lower portions of the boiler around the ash-pit is supplied to the said box *h*. These supply-pipes are fewer in number than the grate-bars, but their united capacity is equal, or substantially equal, to that of the grate-bars, and they are preferably arranged to enter the water-space of the boiler at opposite or widely-separated points, as shown in Fig. 4. By this arrange-

ment a very complete circulation is maintained.

The furnace-shell is preferably cylindrical, as shown, which lessens the cost of construction, while the arrangement of the circulating-pipes is such as to permit of their ready renewal when that becomes necessary. The fuel-door is shown at F and the ash-pit door at P.

In operating the furnace fuel is placed on the grate-bars, and air is admitted preferably through the fuel-door. The draft passes through the fuel between the grates into the combustion-chamber or ash-pit, then up through the flues *d* to the smoke-chamber and uptake. The products of combustion, such as gases and smoke, are largely consumed in the combustion-chamber, and the water-circulating pipes are subjected to an intense heat. No considerable mass of water exists in the boiler which is not subjected to a heating-surface. In this way steam is rapidly and efficiently produced, the whole mass of water in the boiler being heated uniformly.

The peculiar construction of the furnace above referred to, and which is shown in the accompanying drawings, is not claimed herein, the same being made the subject of a separate application for Letters Patent filed by me January 18, 1892, Serial No. 418,381.

What I claim is—

1. A steam-boiler having an interior steam-chamber distinct from and in addition to the steam-space of the boiler, the said chamber being open at its top and surrounded by a water-space, and also having tubular flues exterior to and surrounding or partially surrounding said steam-chamber, substantially as shown and described.

2. An upright steam-boiler having an interior steam-chamber located between the crown-sheet and the upper tube-sheet and having vertical tubular flues outside said steam-chamber, substantially as shown and described.

3. A downdraft boiler-furnace having an interior steam-chamber, the walls of which are secured to the tube-sheet and which is connected with the steam-space of the boiler by the connecting-pipes *a'*, substantially as shown and described.

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

EDWARD B. PARKHURST.

Witnesses:

WM. A. MACLEOD,
ROBERT WALLACE.