(No Model.) 2 Sheets—Sheet 1.

J. LAPP.

STEAM BOILER AND HEATER.

No. 491,804. Patented Feb. 14, 1893.

Fig. 1.

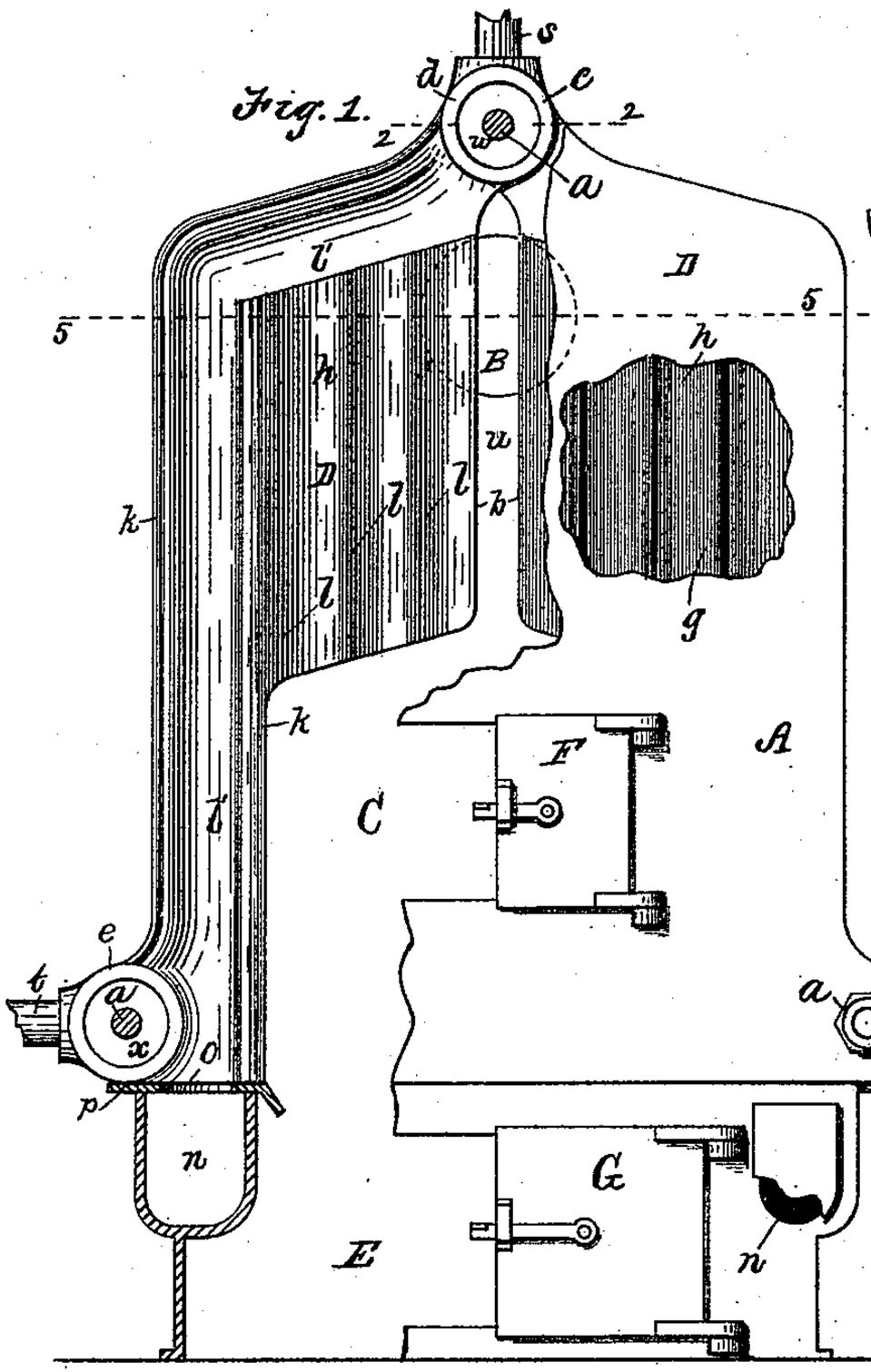


Fig. 3.

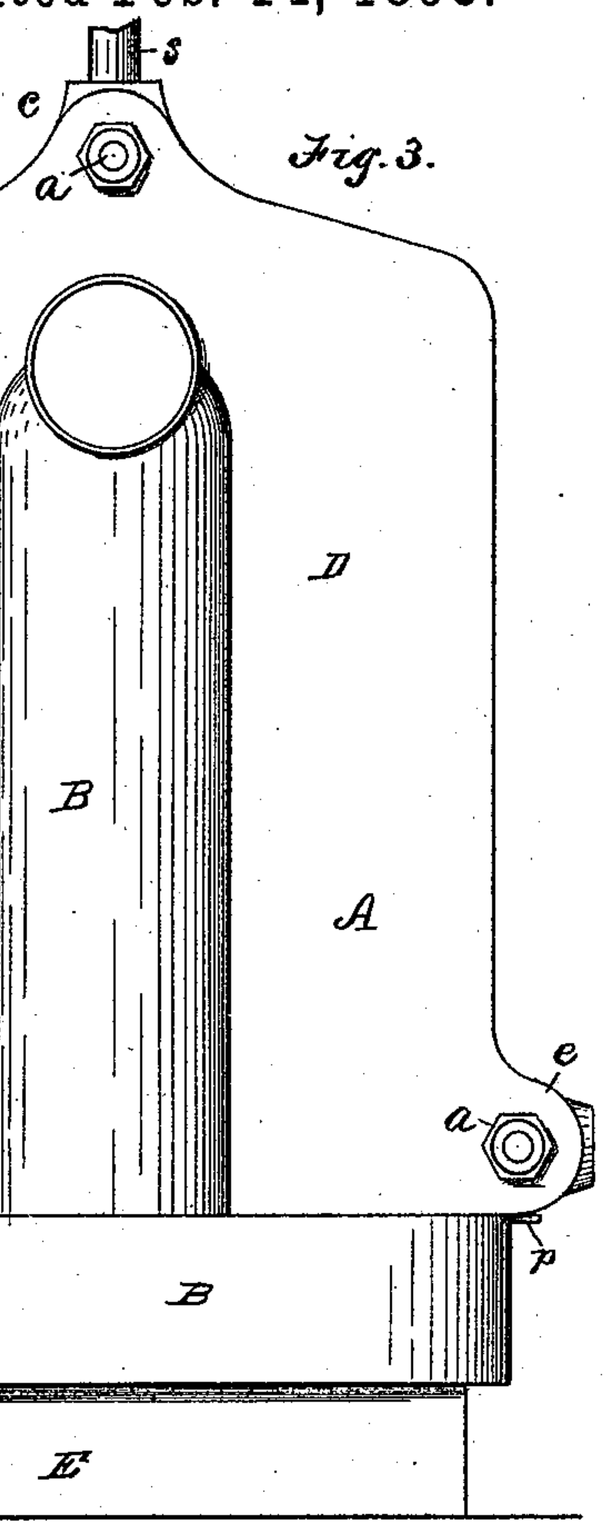


Fig. 2.

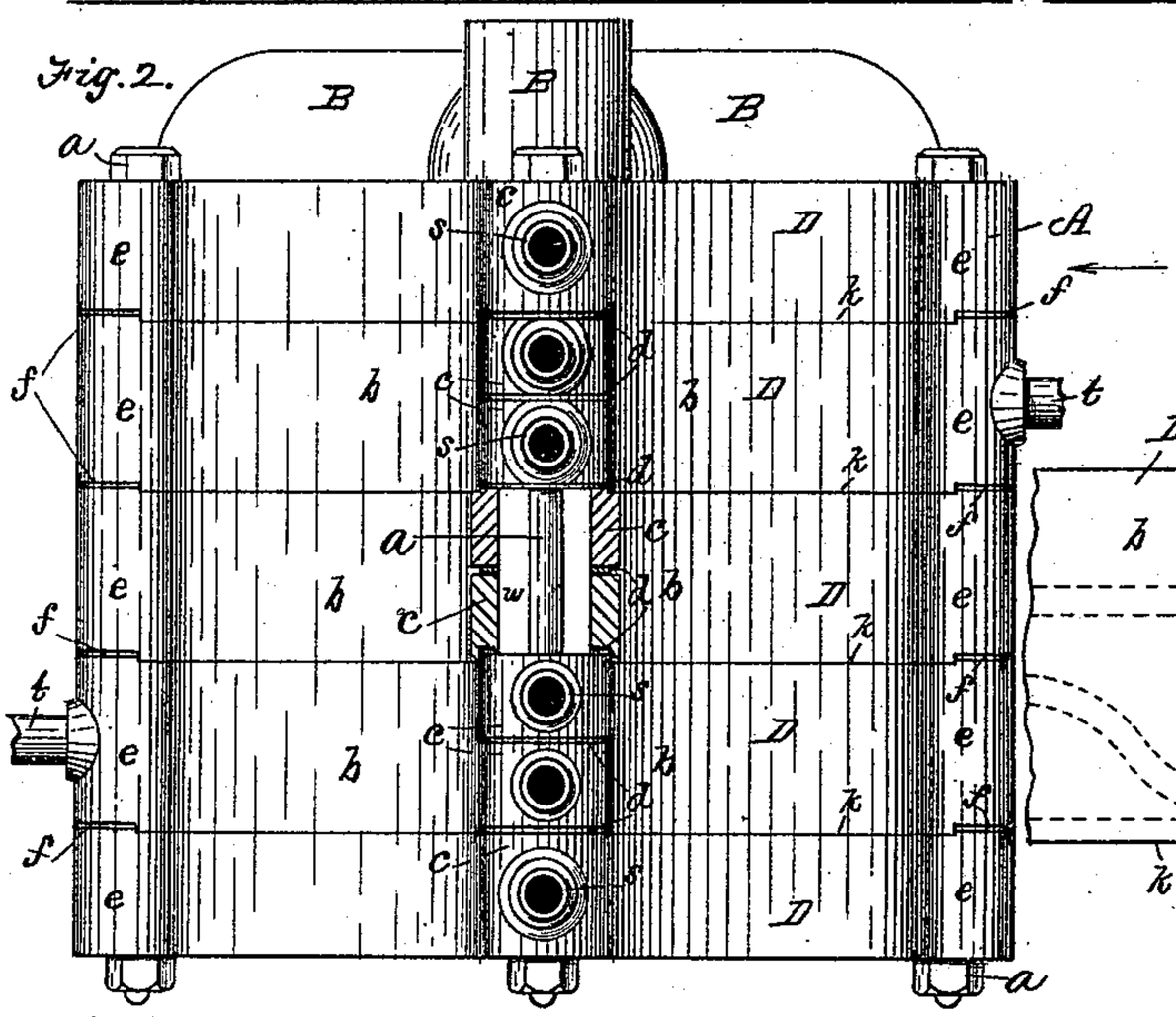
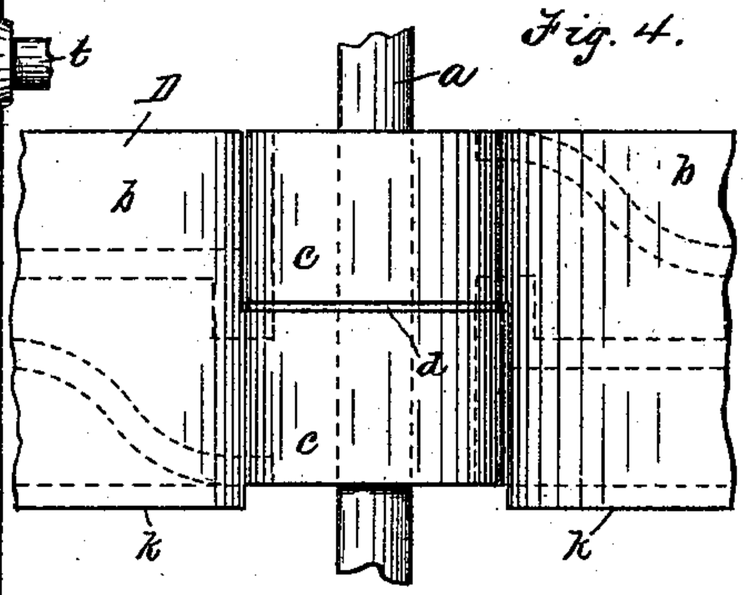


Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

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STEAM BOILER AND HEATER.

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Fig. 5.

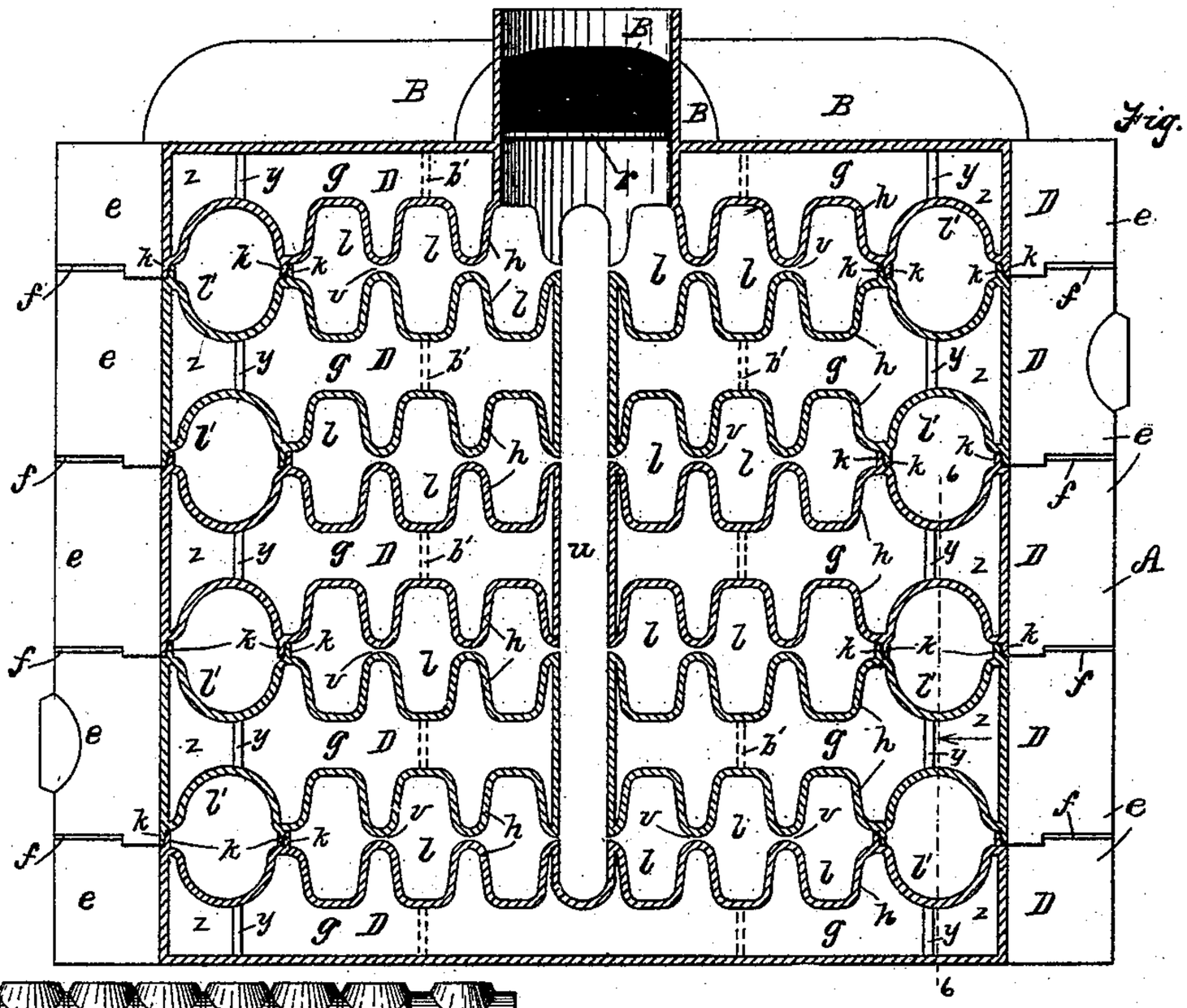


Fig. 6.

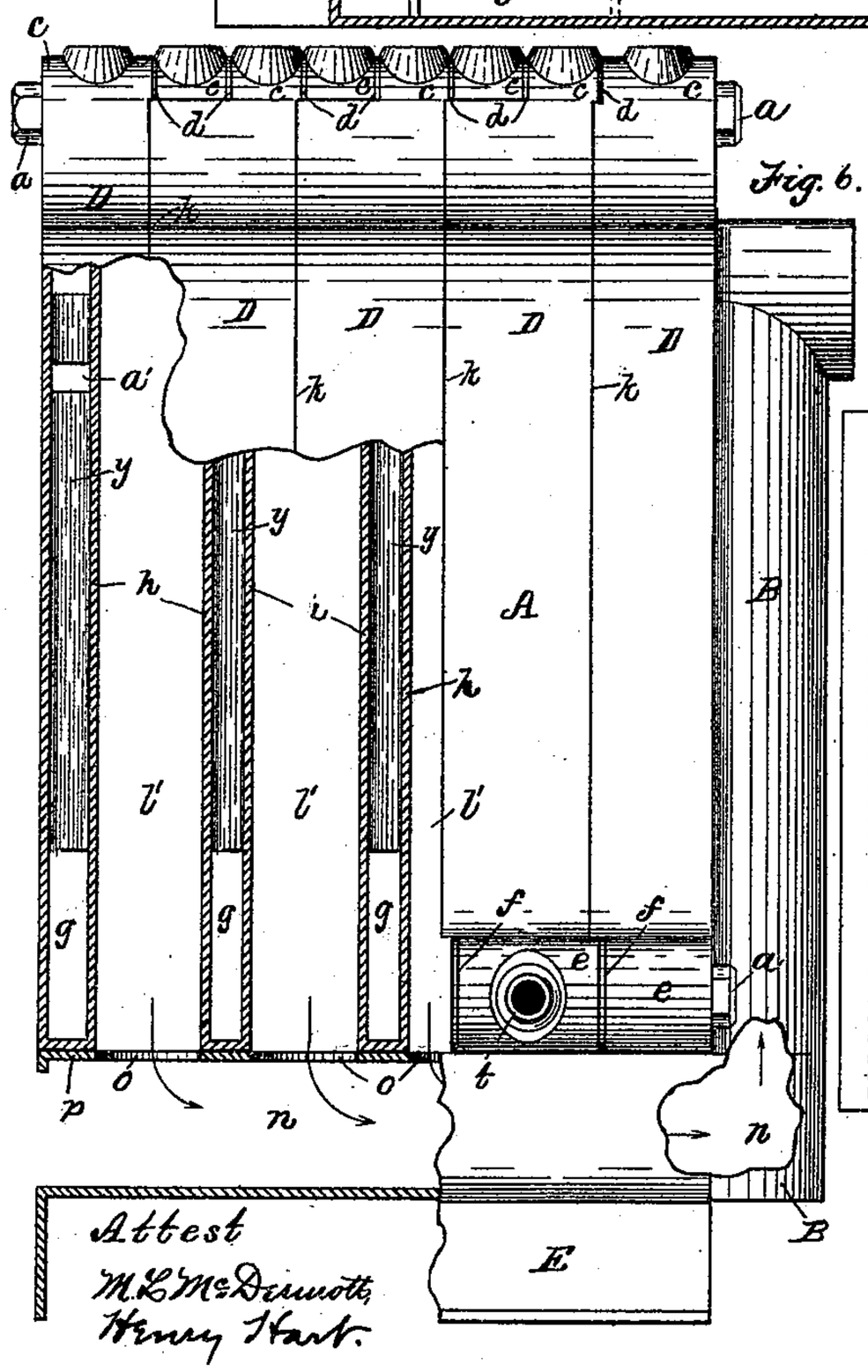
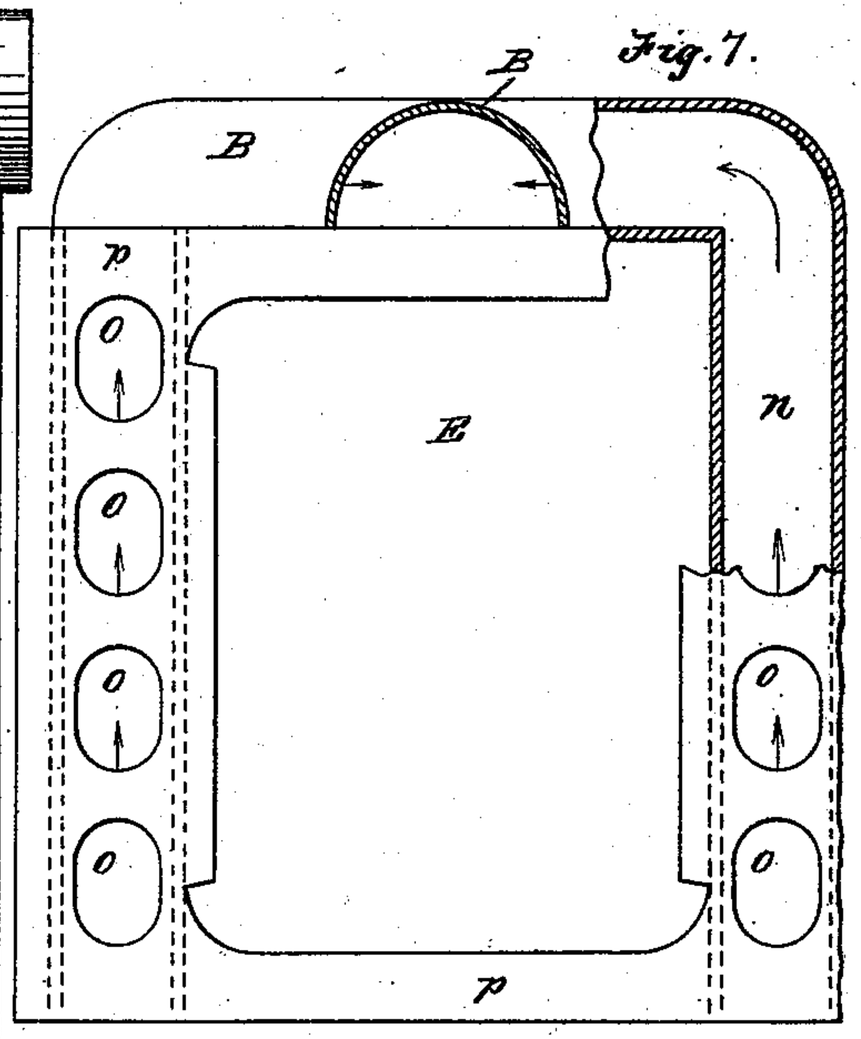


Fig. 7.



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Henry Hart.

Inventor:
John Lapp,
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UNITED STATES PATENT OFFICE.

JOHN LAPP, OF ROCHESTER, NEW YORK.

STEAM BOILER AND HEATER.

SPECIFICATION forming part of Letters Patent No. 491,804, dated February 14, 1893.

Application filed October 7, 1892. Serial No. 448,113. (No model.)

To all whom it may concern:

Be it known that I, JOHN LAPP, of Rochester, in the county of Monroe and State of New York, have invented a new and useful Improvement in Steam Boilers and Heaters, which improvement is fully set forth in the following specification and shown in the accompanying drawings.

The object of my invention is to produce a new and improved device for heating water or generating steam, the same being hereinafter fully described and more particularly pointed out in the claims.

I construct this heater or steam generator with especial reference to securing a free and rapid circulation of the water and preventing stagnant or sluggish masses of water from forming within the boiler, so that the furnace heat may be as rapidly absorbed as possible by the water.

Referring to the drawings Figure 1 is a front elevation of my improved heater or steamer, parts being broken away and vertically sectioned. Fig. 2 is a plan of the same with a portion of one of the sections horizontally sectioned on dotted line 2 2 in Fig. 1. Fig. 3 is a rear elevation of the device with a part broken away. Fig. 4 is a plan of the two halves of a section drawn to better show the manner of joining them. Fig. 5 is a horizontal section on the line 5 5 in Fig. 1. Fig. 6 is a side elevation seen as indicated by arrow in Fig. 2, a part being vertically sectioned as on the dotted line 6 6 in Fig. 5. Fig. 7 is a plan of the base, a part being broken away to show the smoke flue. Figs. 4 and 5 are drawn to scales larger than that of the other figures.

Referring to the parts shown A is the body of the steam boiler or heater, B being the external smoke pipe. The boiler is made up of sections, D, each being composed of two equal and similar half-sections or parts *b b* joined at the top and bottom, as shown, and held together by horizontal fastening bolts *a* passing through from front to rear.

C is the furnace-space, and E the ash pit, F and G being the doors for the furnace and ash pit respectively.

The grate, which is to be of common kind in steam boiler furnaces, is not shown.

Each half-section is formed with a longitudinal hollow cylindrical head *c*, joined as shown in Fig. 4, with a thin gasket *d* between them. These half-sections, as shown, are flat and when joined to form a section are placed edge toward edge, in a plane. The heads *c* of the half-sections are offset or, rather, halved together, and overlap, as shown, and they collectively constitute a continuous cylindrical space or chamber *w*, for water or steam from front to rear of boiler as shown in Figs. 2 and 6. The upper fastening bolt *a* for the sections passes centrally through this cylindrical space. At the bottom of the boiler, at each side thereof, other similar heads or projections *e* are formed, with packing gaskets *f* between them. These together form continuous water spaces or chambers *x* from front to rear of boiler through which, respectively, the lower fastening bolts *a a* pass, as in the case of the heads *c*.

In constructing the boiler the sections are placed side by side and in contact, all being held together by the bolts *a* as stated.

The extreme or outer sections of the boiler are each preferably made in a single piece and form, in a sense, covers for the intermediate sections. Each half-section is formed with an internal water space *g* inclosed by opposing corrugated walls *h h*. In case of the end sections but one wall—the inner—is corrugated, the outer wall being plain. The corrugated walls being depressed below the edges of the section, give to the latter the character of an internal water space with external heat spaces opening out at the sides in opposite directions, said water space and the heat spaces being parallel with the plane of the section. When the sections are put together to form a boiler the corrugated or depressed walls *h h* face each other. And on account of the corrugations being similar and directly opposite each other, rows of vertical heat passages *l* are formed over the furnace, and descending smoke-flues *l'* are formed along the sides of the boiler, as shown in Figs. 1 and 5. The heads *c* are projected from the edges of the respective half-sections so as to overhang the latter, on account of which a vertical space *u*, Figs. 1 and 5, is left between the half-section when joined, over the furnace. The sections are formed with water-legs at the sides, and are further provided with flanges *k k* Figs. 1 2, and 4, which overlap as shown in Fig. 5. The

horizontal water chambers x x, are outside of the water-legs and communicate with them, and being thus removed from the furnace the packing gaskets are not affected by the heat. The axes of the chambers x x and w are at right-angles with the planes of the sections. The heat passages l l formed between each pair of adjacent sections open at their upper ends into the descending smoke flues l', as shown in Fig. 1. These flues extend downward at either side of the section, along opposite sides of the respective water-legs, and communicate with horizontal smoke flues n formed in the base beneath the boiler. The smoke flues l' are formed by the opposing curves in the corrugated walls h and are larger in cross section than the heat passages l, as appears in Fig. 5. The overlapping flanges k extend substantially from bottom to top at either side of each flue l' as shown in Fig. 1, so as to render them practically tight against the inflow of smoke or heated air except at their upper ends. The joints between the flanges k k are designed to be cemented in the usual manner.

The flues n are shown more fully in Figs. 1, 6 and 7. The several flues l' open at their lower ends into the flues n through openings o in the horizontal plate p covering the base and upon which the boiler rests. The flues n extend to the back of the ash pit and communicate with the horizontal part of the smoke pipe B thence upward through the vertical part, as indicated in Figs. 6 and 7.

The upper horizontal part of the smoke pipe B extends inwardly through the adjacent section D to the nearest heat passages l l, as shown in Figs. 1 and 5, for the purpose of giving to the furnace a direct draft to the chimney instead of causing the draft to be made through the lower horizontal flues n. (A simple damper r of common construction and working in an ordinary manner is provided to regulate the passage from the interior to the pipe B.)

Exit pipes s, for water or steam as the case may be, are inserted in the heads c, as shown, or such of the heads as may be necessary in any given case. Likewise, inlet pipes, t, for water are inserted in the parts e, as shown.

The corrugations in the opposing walls h h, that approach each other when the sections are joined to form a boiler, come near together but do not touch, there being left slight spaces, v, between them, as shown in Fig. 5. These spaces permit a small part of the furnace heat to pass laterally from one heat passage l to another, while the main volume of the products of combustion pass up the heat passages to the flues l', as above described. The water space, g, of each half-section continues upward into the chamber w of the head c, and also downward at the sides of the furnace to the spaces x x in the parts e e. I employ vertical partitions, y, Figs. 5 and 6, through the water spaces between the flues l' so as to divide the upflowing and downflowing currents of water. The action of the water on account of the furnace heat is to flow upward between said partitions and the interior of the boiler, thence downward through the water spaces z between said partitions and the outer walls of the boiler when the water is cooler. These partitions stop considerably short of the bottom of the boiler and also of the top, so that there may be a free flow of water around both ends of each partition. And I prefer to form these partitions with openings a' near their upper ends so that should the water become low it may still flow over the partition through these openings so as to circulate freely. There may be two or more openings a' in the partitions if found desirable.

These boilers are designed to be made of cast iron, each half-section being cast in one piece. And the opposing corrugated walls of each piece are stayed by cross ties of some form, shown by dotted lines b' in Fig. 5.

In constructing some boilers or heaters, notably small ones, I prefer to cast the sections in one piece instead of making them up of two halves joined as above described. Also the sides of the sections may be made plain instead of corrugated, as shown, but I prefer to corrugate them.

What I claim as my invention is:

1. A flat section for a steam boiler or heater, composed of two similar half-sections joined in a plane and having their opposite sides or faces corrugated, with water spaces within said half-sections, the latter being formed at their upper ends with parts or heads lapping upon each other and direct communication for water between them, and fastening bolts for the half-sections passing through said heads, substantially as shown and described.

2. A steam boiler consisting of a series of flat sections joined side by side each containing two water spaces (one in each half of the section) connected at the top, the opposing walls of the sections being similarly corrugated, the two extreme or outside troughs between corrugations of each section joining respectively the like troughs in the adjacent section to form continuous descending flues for the smoke, the walls of said flues being imperforate and unbroken, substantially as shown.

3. A steam boiler or heater consisting of sections joined, and having rows of vertical heat passages, and water spaces alternated with said rows of heat passages and separated therefrom by corrugated partitions, and descending smoke flues communicating with horizontal flues beneath the boiler, substantially as shown and described.

4. A steam boiler composed of joined sections, and having rows of heat passages and water spaces alternated and divided by corrugated partitions, and descending smoke flues communicating with horizontal flues beneath the boiler, said rows of heat passages and the water spaces being in parallel planes

crossing the boiler, substantially as shown and described.

5. A steam boiler composed of joined sections, and having parallel rows of heat passages and water spaces alternated, and descending smoke flues at the sides of the boiler, the water spaces being divided by cross partitions, *y*, near the sides of the boiler, substantially as and for the purpose specified.

6. A steam boiler composed of sections joined and having parallel rows of heat passages and descending smoke passages terminating each of said rows of heat passages, said heat and smoke passages being alternated with water spaces in planes crossing the boiler, the water spaces being divided by cross partitions near the sides of the boiler and connecting the adjacent walls of said smoke passages, substantially as shown and described.

7. A steam boiler composed of sections joined and having parallel rows of heat passages and descending smoke passages terminating each of said rows of heat passages, said heat and smoke passages being alternated with water spaces in planes crossing the boiler, the water spaces being divided by cross partitions near the sides of the boiler and connecting the adjacent walls of said smoke passages, said cross partitions being perforated near their upper ends, and spaces beneath them, substantially as and for the purpose specified.

In witness whereof I have hereunto set my hand, this 4th day of October, 1892, in the presence of two subscribing witnesses.

JOHN LAPP.

Witnesses:
ENOS B. WHITMORE,
M. L. MCDERMOTT.