(No Model.) 3 Sheets—Sheet 1.

J. L. GILL, Jr.

STEAM BOILER.

No. 400,448. Patented Apr. 2, 1889.

Fig. 1.

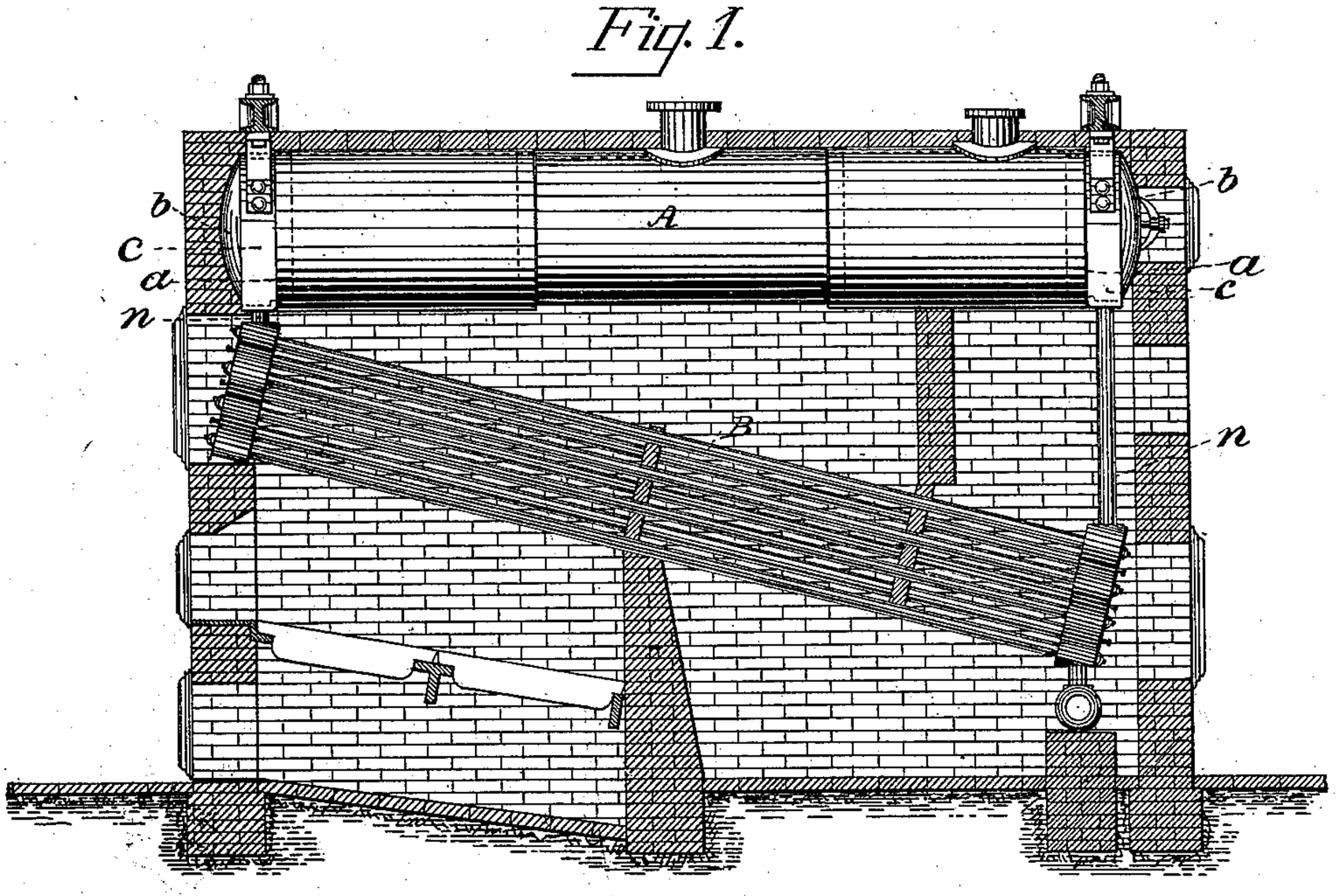
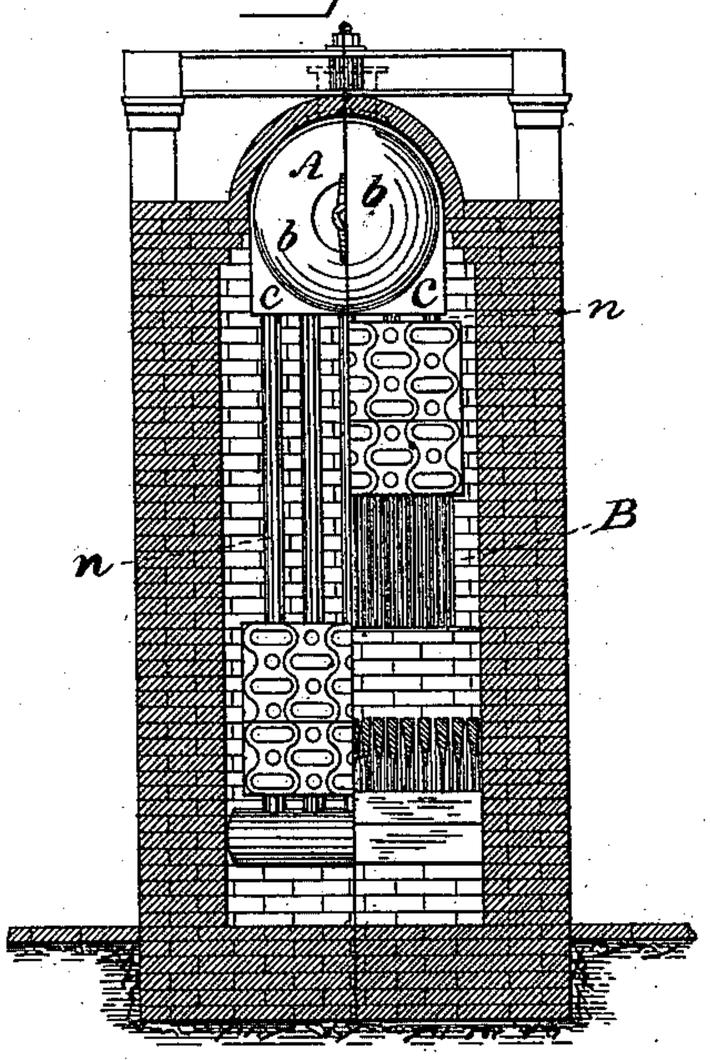


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 5.

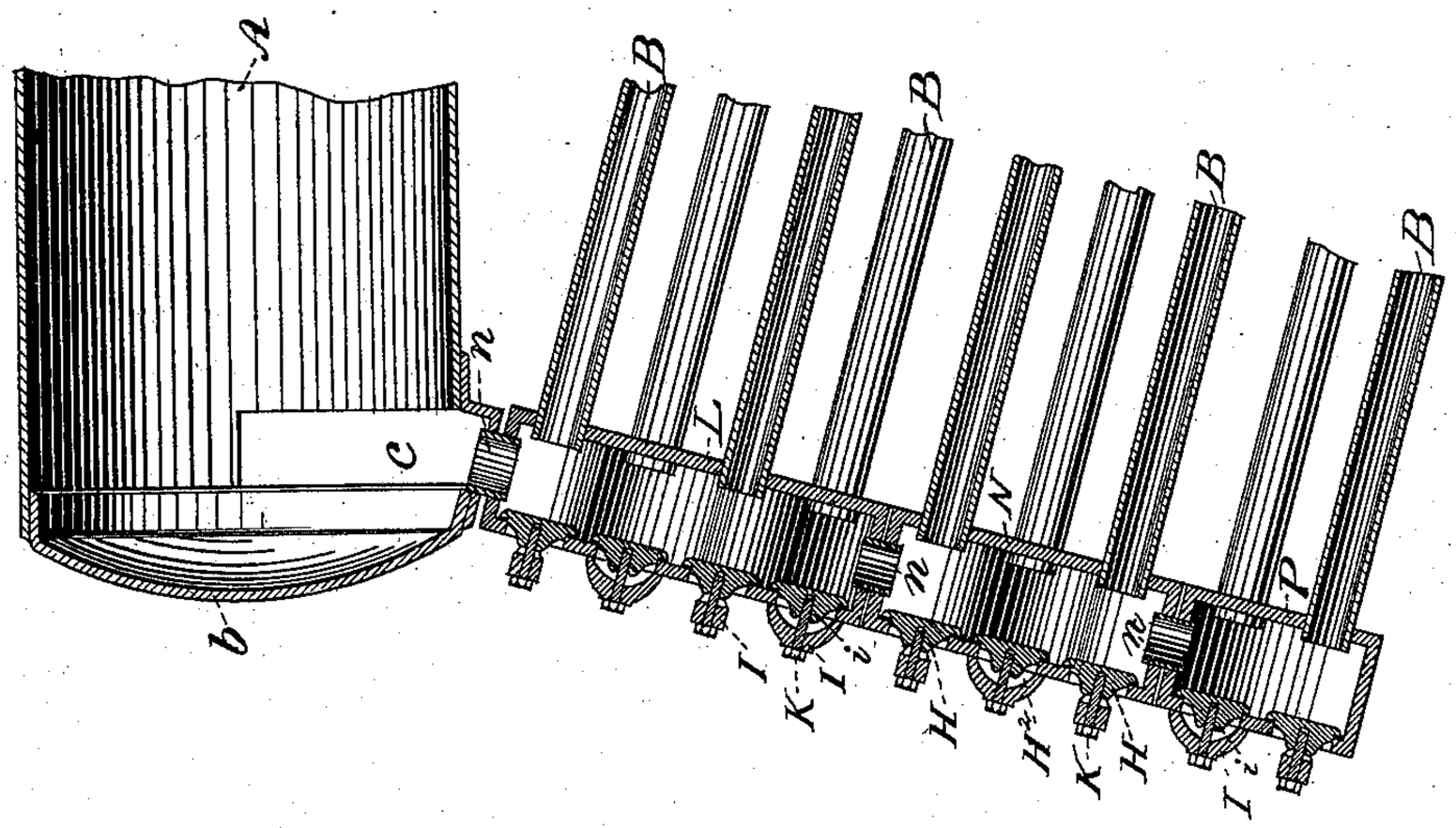

Fig. 4.

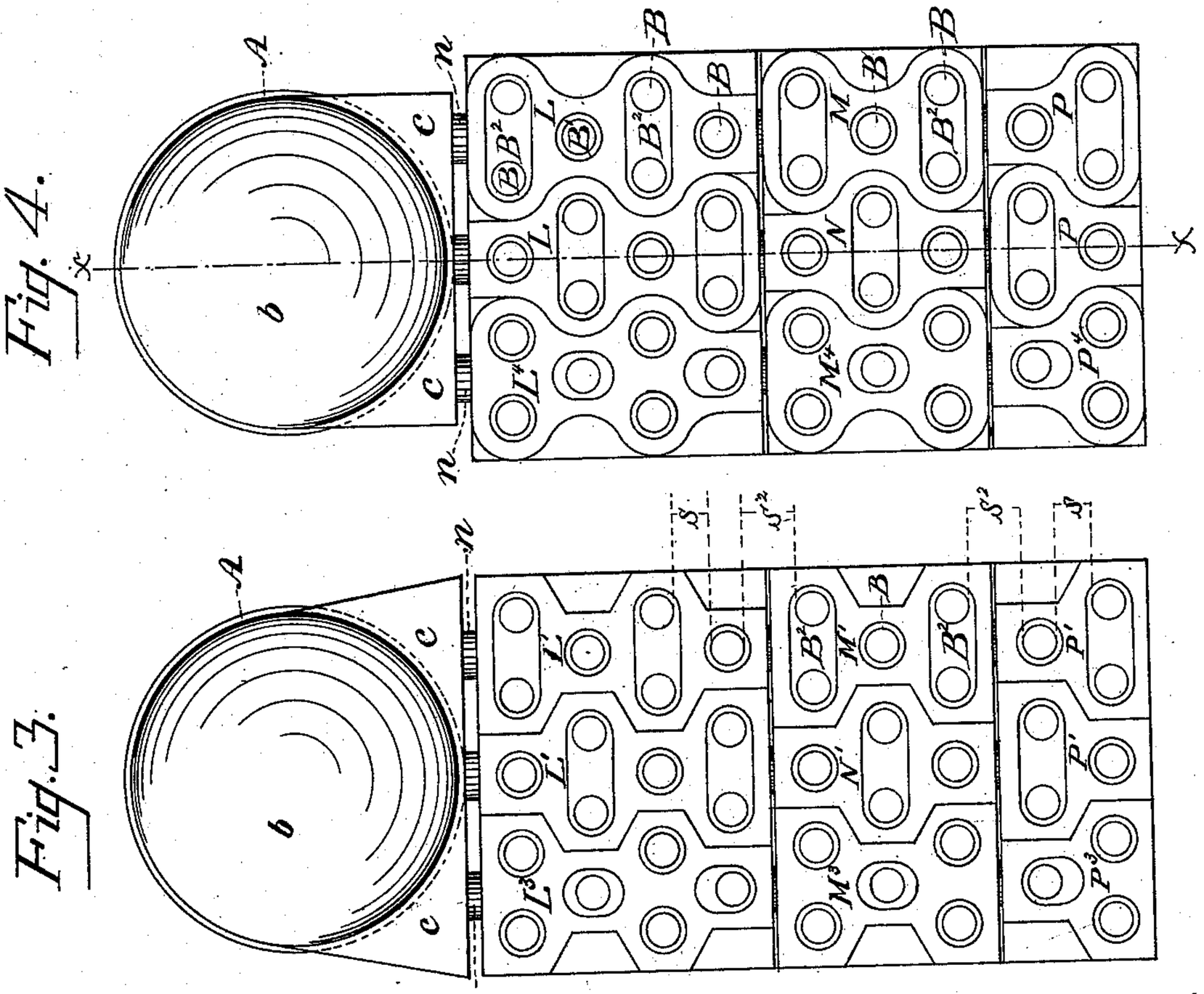

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

J. L. GILL, Jr.

STEAM BOILER.

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Fig. 7.

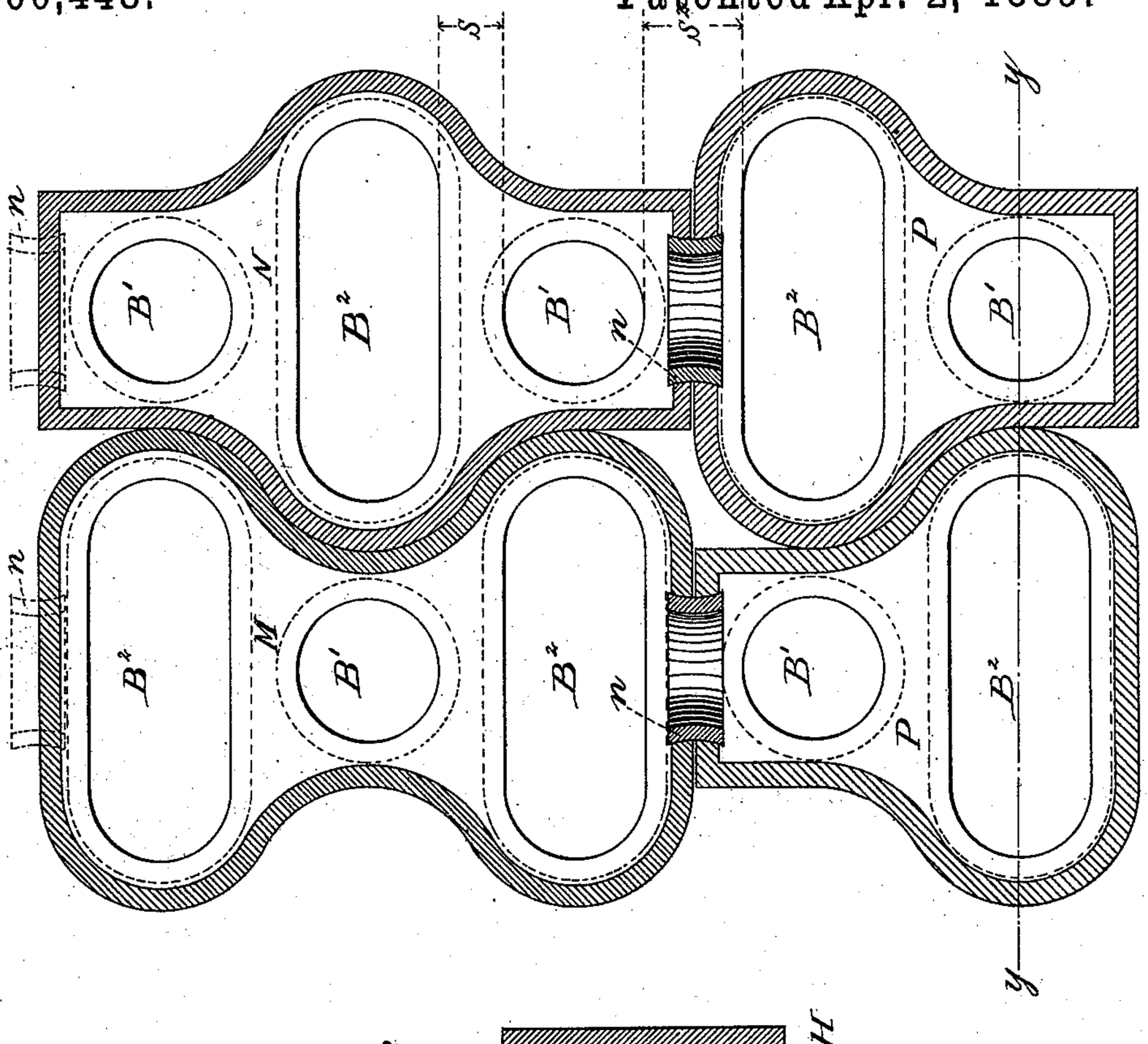
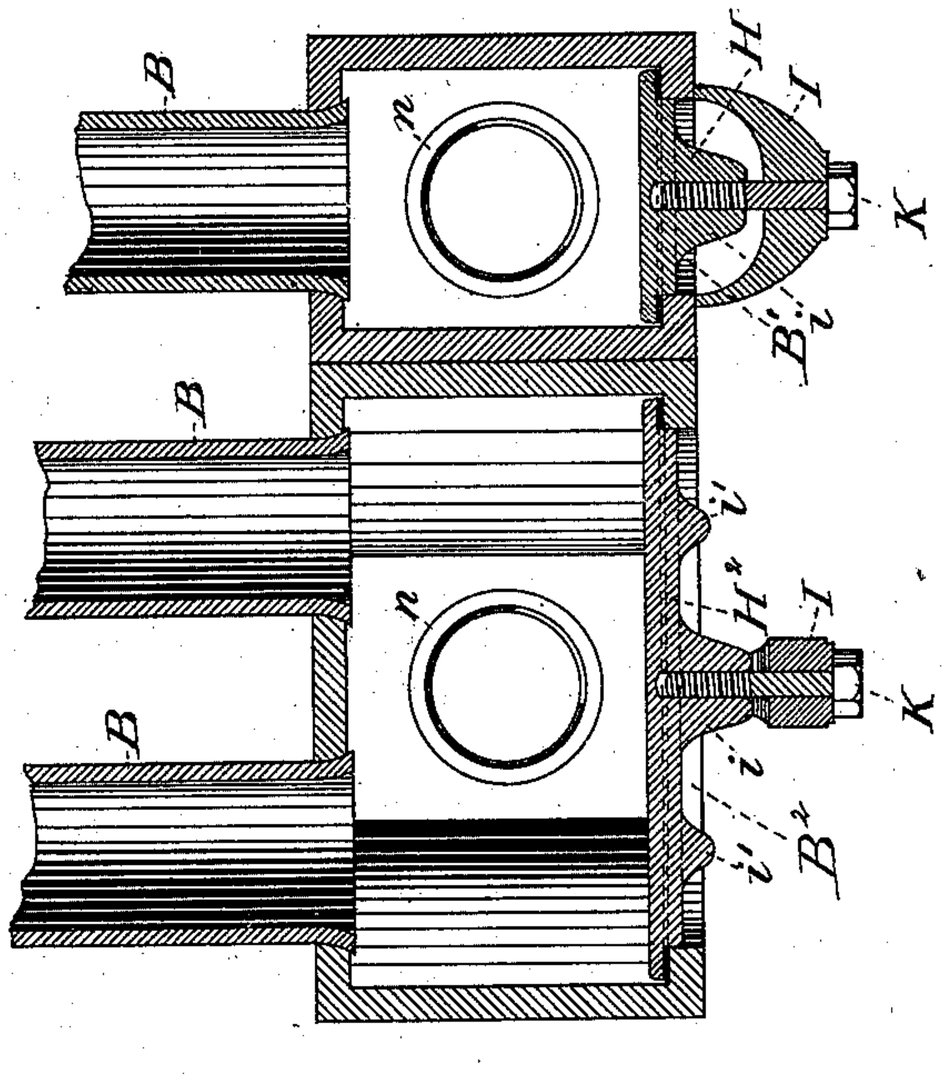


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN L. GILL, JR., OF PHILADELPHIA, PENNSYLVANIA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 400,448, dated April 2, 1889.

Application filed July 9, 1886. Serial No. 207,534. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. GILL, Jr., a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

In the Letters Patent granted to me under date of February 9, 1886, No. 335,750, is shown and fully described the manner of making the front and back water-legs of a sectional water-tube boiler of a series of headers with tubes arranged at or nearly equal distances apart—that is, with one tube above a pair of tubes, or a pair of tubes above a single tube, in any desired number of courses, and the sides of the headers assuming zigzag courses in curvilinear or broken straight lines in vertical directions, so that when a number of headers are placed side by side they will interlock with each other, and thus preserve the general arrangement of the tubes at nearly equal distances apart.

In my present invention the system of staggering the tubes is preserved, with this exception, that the space between the rows of tubes where two boxes are united is greater than the horizontal spaces, in order that the space above the top tubes and below the bottom tubes of a box may be the same as the space at the sides of the tubes—that is, the space between the tubes and the inside walls of the box is made substantially uniform entirely around the box, whereby sufficient space is obtained around the openings in the covers to receive packing for making steam-tight joints. By this arrangement the equidistant spacing of the tubes, heretofore so much desired, is broken up; but the change is so slight that the advantage of equal spacing is not materially destroyed, and thus it becomes possible to use the well-known inside hand-hole plates for closing the openings in the headers or boxes.

My invention consists of an improved steam and water drum having at each end a head in which the lower half forms on each side the front of a pocket having a level floor or base, or one dipping with the inclination of the tubes, and said pockets having vertical sides, or sides inclined in either direction to the circumference of the drum, as the floor or base is made wider or narrower than the diameter of the drum. In the floor of the pocket or pockets are provided openings for the reception of nipples or pipes, whereby said drum may be brought into communication with the headers or boxes.

My invention further consists of the construction, arrangement, and combination of parts in a water-tube steam-boiler, hereinafter described, and pointed out in the claims.

In the accompanying drawings my invention will be found fully illustrated, in which—

Figure 1 is a side elevation of a sectional water-tube boiler occupying a position ready for use, with my improved drum provided with pockets at each end, my improved headers with inside hand-hole covers, and also showing in this view a mud-drum and long and short pipes or nipples for connecting the respective parts of this type of a water-tube boiler. Fig. 2 is a sectional elevation showing front and rear views, respectively, of a sectional water-tube steam-boiler. Fig. 3 is an outline view showing my improved steam and water drum, with its pockets *c c*, having inclined sides and connected, by means of expanded nipples *n n*, with a water-leg composed of a number of my improved headers, in which the sides thereof are in the form of broken straight lines. Fig. 4 is a similar outline view of my improved steam and water drum, with vertical sides to the pockets and a water-leg composed of a number of my improved headers having curvilinear sides.

In Figs. 3 and 4 are shown boxes for the insertion of three tubes, as P, P, P′, and P′, boxes for four tubes, as N and N′, boxes for five tubes, as M, M′, M^4, and M^3, and boxes for six tubes, as L, L, L′, and L′. In Fig. 3 the boxes L^3, M^3, and P^3 and in Fig. 4 the boxes L^4, M^4, and P^4 are shown with the openings opposite the single tubes made oval in a vertical direction, in order that the inside hand-hole covers may be inserted edgewise and then turned to their proper position for closing the opening or openings therein. In Fig. 3 boxes L′, M′, N′, and P′ and boxes L, M, N, and P in Fig. 4 are shown with the holes B′ opposite the single tubes round, but large enough to slip a single tube through, and the openings B^2 opposite the horizontal pair of tubes made

oval, to provide room for operating the expander while expanding the vertical pipes or nipples *n n* in place, and to slip the round hand-hole covers in for closing the round openings and the covers for closing the oval openings.

Fig. 5 is a vertical section on the line *x x* of Fig. 4, showing the water-tubes B B B and a header composed of boxes L, N, and P, with their hand-hole covers H H^2, covering the openings in the front of the boxes, and opposite the tube-openings provided with arched dogs I and bolts K, for securing the covers in their respective positions. The front end of the drum, with its pockets *c c*, is shown with the floor inclining in the direction of the dip of the tubes, and into which floor the nipples *n n* are expanded and their opposite ends expanded into the headers or boxes in a similar manner, and as so united fully illustrating the continuous passage of the water and steam from the tubes to the separating-drum.

Fig. 6 is a transverse section, on the line *y y* of Fig. 7, of a pair of headers placed side by side, showing two water-tubes, B B, in one box and one tube, B, in the other box, and also the openings B′ and B^2, through which the tubes are passed before expanding, the covers H H^2 for closing the openings, and the arched dog I and bolt K, by which the covers are secured in their respective positions. The covers H are provided with hubs *i*, which are tapped to receive the bolts, and the hubs *i′ i′* are used to strike upon when necessary to loosen the covers, should they become cemented by deposits of lime or other foreign matter; or they may be tapped for bolts, if desired. The space between the cover and the back of the front wall (shown by the black line) is filled with any good steam-packing to prevent leakage.

Fig. 7 is a sectional view of a pair of headers constituting a water-leg. The first header is composed of boxes M and P, nippled together, and the second header is composed of boxes N and P, nippled together, and they in turn are nippled to the drum in any suitable manner. In each of these boxes the openings B′ are shown round and just large enough to slip one tube through, while the openings B^2 opposite the horizontal pair of tubes are made large enough to slip two tubes through, and the round cover H with its projecting flange for covering the round hole and the oval cover H^2 for covering the oval hole. The dotted lines around the openings and just inside of the walls of the boxes indicate the boundary-lines of the covers. It will, however, be observed that the horizontal space S^2 between the tubes of two boxes is greater than the space S between the two horizontal rows in any of the boxes, which allows sufficient room between the openings B′ and B^2 and the boundary-line of the cover (indicated by the dotted line) to receive packing sufficient to make a good steam-tight joint. The increased length of the box, both at the top and bottom ends thereof, makes it practicable to use the inside covers, whether the openings for the insertion of the covers are made oval in vertical or horizontal directions.

In Figs. 1, 2, 3, 4, and 5 the steam and water drum A and the wrought-iron or steel heads *b b* are fully shown. These heads are flanged all around their edges to receive the rivets by which they are secured to the shell, and are made with plane concave or convex surfaces. The upper half of the heads is made semicircular and the lower half made with either vertical sides, as shown in Fig. 4, or with the sides inclined toward the circumference of the drum, as shown in Fig. 3. The bottom edge of the pocket is made to conform to a straight horizontal line, or inclined in the direction of the dip of the tubes, and of a length commensurate with that of the width of the water-leg.

The sides of the drum at each end, respectively connected with the lower half of the head, are extended backward from the head some eight inches, (more or less,) as may be required for the different-sized connections, thus making continuous pockets *c c* across the front and rear ends of the steam and water drum. The backs of these respective pockets are closed with plates flanged all around and made to conform to the lower half of the heads, and are riveted to the shell of the drum and to the shell of the pockets in any suitable manner. Openings are made in the bottom of these pockets for the insertion of the nipples *n n*, for making steam and water connections between the drum and water-legs without the intervention of saddle-boxes or intermediate manifolds.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a water-tube boiler, a steam and water drum having at each end a head in which the lower half forms on each side the front of a pocket having a level base, or one dipping with the inclination of the tubes, and said pockets having vertical or inclined sides and openings in the base thereof for the reception of nipples or pipes, whereby said drum is brought into communication with the header or headers of the boiler, as shown and described, and for the purposes set forth.

2. In a water-tube boiler, a steam and water drum provided at each end with a pocket or pockets having convex or concave heads and angular sides, pipes or nipples expanded therein and into water-legs composed of headers or boxes, as described, having vertical or horizontal hand-hole openings, caps provided with one or more hubs inserted from the inside of the boxes, and arched dogs and bolts for securing the caps from the outside thereof, substantially as and for the purposes set forth.

3. In a water-tube boiler, a cap provided with one or more hubs projecting beyond the face of each box, in combination with a header or boxes, one or more horizontal oblong hand-

hole openings, and arched dogs and bolts for securing the caps to the headers or boxes, substantially as described.

4. In a water-tube boiler, a longitudinal steam and water drum provided with end pockets having vertical sides, or sides inclined in the direction of the circumference of the drum, in combination with a series of pipes or nipples, front and back water-legs composed of a series of headers or boxes having vertical or horizontal oval or oblong hand-hole openings therein, caps with one or more hubs caused to project beyond the faces of the headers or boxes, and dogs and bolts for securing said caps to the headers or boxes, substantially as and for the purposes set forth.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN L. GILL, JR.

Witnesses:
WALTER S. GIBSON,
J. WALTER DOUGLASS.