

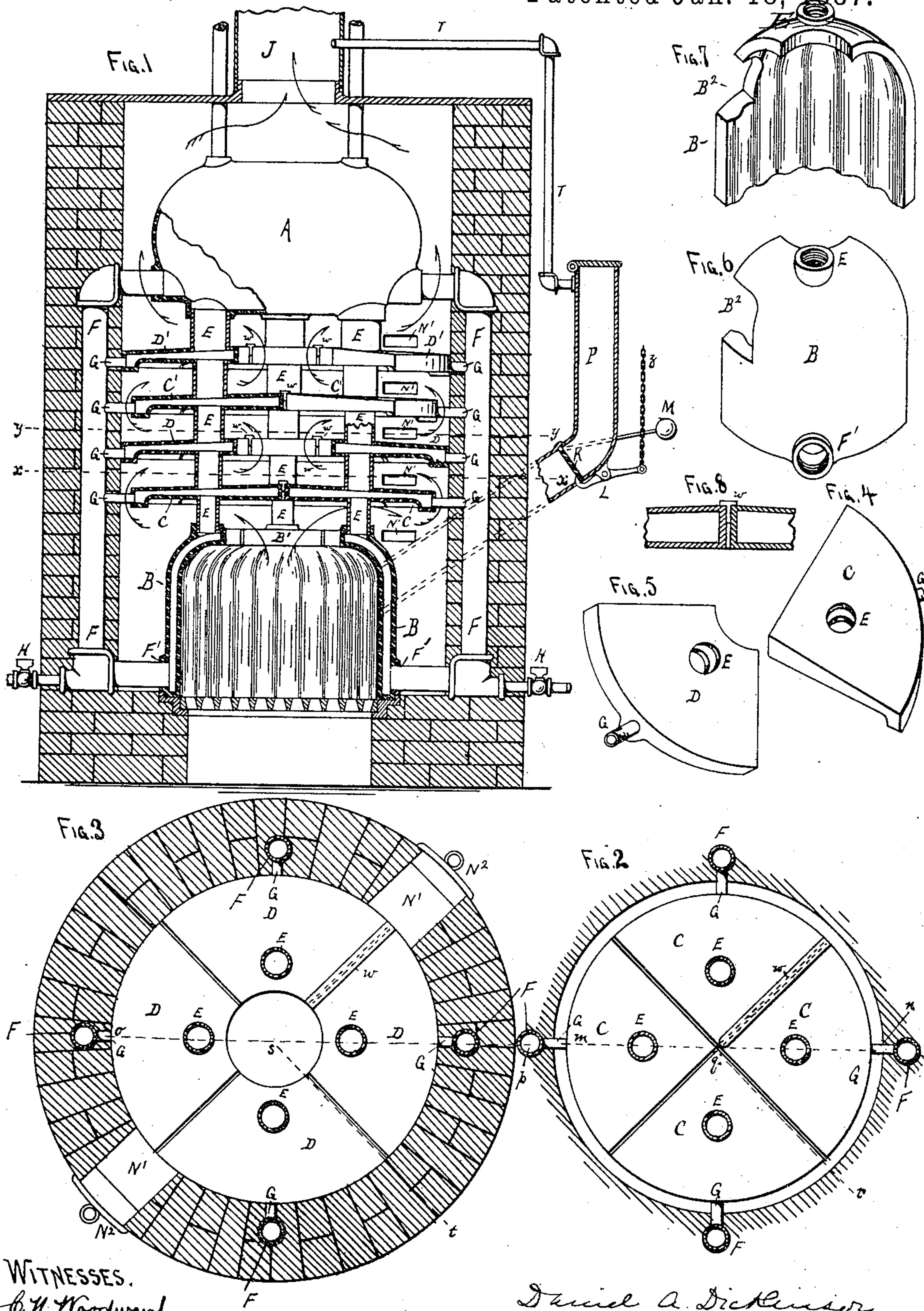
(No Model.)

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STEAM BOILER.

No. 356,103.

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STEAM-BOILER.

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To all whom it may concern:

Be it known that I, DANIEL A. DICKINSON, a citizen of the United States, residing in the city of St. Paul, in the county of Ramsey and State of Minnesota, have invented a new and useful Steam-Boiler, of which the following is a specification.

My invention consists of a sectional steam-boiler, with fuel-magazine, designed for the purposes of steam-heating, my object being, by the means here specified, to secure rapid and economical heating of water and generation of steam, facility of construction and management, as well as of the adjustment of the parts and of the substitution or addition of parts, allowance for expansion and reduction of danger of breakage, perfect and free circulation, strength, durability, and cheapness, and an improved means of supplying fuel to the same.

This invention is illustrated by the accompanying drawings, in all the figures of which the same parts are designated by the same letters.

Figure 1 is a vertical and partially sectional view of the boiler and magazine, shown as inclosed in brick. Fig. 2 is a plan of one of the smaller horizontal sections of the boiler, a cut of which is shown in Fig. 1 at *x x*. Fig. 3 is a plan of one of the larger horizontal sections, showing also the brick inclosure, a cut of which is shown in Fig. 1 at *y y*. Figs. 4 and 5 are detailed perspective views of segments or parts of which the horizontal sections are composed, and which, as combined to form such sections, are shown in plan in Figs. 2 and 3. Figs. 6 and 7 are detailed perspective views of two of the several sections of which the fire-pot is composed. Fig. 8 is an enlarged detailed view showing the manner in which the adjacent segments or parts of the composite sections are adjusted with reference to each other.

The fire-pot B, Fig. 1, and the horizontal sections above it (lettered C C C' C' D D D' D') are each composed of several parts, preferably four parts, and it is in contemplation of such division into four parts that these drawings and specifications are made. The fire-pot B, Fig. 1, is cylindrical in form, composed of four independent sections, inclosing and forming the fire-chamber. In Figs. 6 and 7 are shown

in perspective an exterior and interior view, respectively, of two of these sections. Each of these several sections is hollow and constitutes a thin water-chamber. The upper parts of these sections curve inward, as shown in Figs. 1, 6, and 7, and when in position inclose the upper portion of the fire-chamber, save the circular opening B' in the top, of, say, eleven inches diameter, through which the products of combustion must pass. By giving this crown form to the fire-pot two objects are attained: first, a considerable portion of the fire-pot, with its inclosed water-chambers, is brought directly over and near to the fire; and, second, the heat as it leaves the fire-chamber is directed through the circular opening, B', mentioned to the center of the section C C, so that it is compelled to pass beneath and to act most effectually upon the whole of the under surface of that section. The inner surfaces of the fire-pot sections may be corrugated, so as to present as large a surface as possible to the influence of the heat. The fire-pot is provided with a fuel-door, B². (See Figs. 6 and 7.)

C C C' C' D D D' D', Fig. 1, are the same horizontal sections, plan views of which are shown in Figs. 2 and 3, Fig. 2 being a plan of the sections C C C' C', and Fig. 3 a plan of the sections D D D' D'. The cut shown of the two lower of these sections, C C D D, Fig. 1, is indicated in Figs. 2 and 3 by the dotted lines *m n* and *o p*, respectively, while the lines of view of the two upper sections, C' C' D' D', are in like manner shown in Figs. 2 and 3 by the lines *m q r* and *o s t*, respectively. These sections are flat circular disks in horizontal planes, each of which is composed of several (here four) independent segments or parts. Detailed views of these segments are shown in Figs. 4 and 5, and their relation to each other and the manner in which they are combined appear in Figs. 2 and 3. Each segment of these horizontal disks is hollow and forms a shallow water-chamber. These water-spaces may be three-eighths or one-half of an inch thick at the most shallow part, near the outer edge, (see Fig. 4,) and increase in depth to one inch as the inclosed space narrows toward the apex of the segments. Around the curved edges of these segments the water-space is also enlarged to one inch in thickness, to facilitate the sup-

ply and circulation of water (received through the pipes lettered G) to and through all parts of the segments. The segments composing the sections C C C' C', Figs. 1, 2, and 4, are so much smaller than those composing the sections D D' D' D', Figs. 1, 3, and 5, that when in position, as in Figs. 2 and 3, the former horizontal disks (C C C' C') will be four inches less in diameter than the latter, (D D' D' D'), thus leaving a space two inches wide, Figs. 1 and 2, between the smaller disks and the inclosing brick-work, through which the products of combustion must pass. The apex or angle of each segment composing the larger disks is cut off, as shown in Fig. 5, so as to form, when in position, the circular opening, of, say, ten inches diameter, at the center of the disk, Fig. 3, through which the products of combustion must pass. The brick inclosure of the boiler, or the metallic jacket which may be employed in its stead, will form a perpendicular wall or casing around and in close contact with the outer edge of the larger horizontal disks. In Fig. 3 this inclosure is shown in brick-work surrounding one of the larger horizontal disks. Openings N', with adjustable stoppers N², will be left through this inclosure, opposite the spaces between the horizontal sections, for cleaning all the surfaces exposed to the action of the fire.

The sections of the fire-pot and the segments of the horizontal disks may be strengthened (if made of cast-iron) by means of connecting-stays in the castings between the sides inclosing the water-chambers in the same.

In Fig. 1 the parts lettered E, and the like parts shown but not lettered, are pipes connecting each section of the fire-pot and each segment of the horizontal disks with the one above the same, and at last with the steam-chamber A. The openings into which these pipes enter are marked by the same letter, E, on Figs. 2, 3, 4, 5, 6, and 7. These pipes serve to convey steam and boiling water from the fire-pot and the horizontal disks to the steam-chamber, and each pipe should be larger than the one immediately below it. By these pipes the horizontal sections are separated not more than, say, two and a half or three inches. The pipes are cut with right and left screws, by means of which the connections are made.

The sections of the fire-pot are not directly connected with each other, but may be somewhat loosely bound in their proper positions by an iron band around the whole. Neither are the segments composing the horizontal sections to be connected with the other parts of the same sections in the same horizontal plane. These separate parts of the fire-pot and of the horizontal sections are only connected perpendicularly with each other and to the steam-chamber A by the pipes E, as above stated, only one pipe uniting any two of such segments or sections. The parts being thus independently arranged, the connecting-pipes E may be screwed up until the joints are tight, notwithstanding any slight irregu-

larity in the cutting of the threads or any other mechanical imperfection in the making of these connections. A thin space will be left between the parts composing the several sections, to allow for expansion from heat and to facilitate the connecting of the parts, as above stated. These spaces may then be loosely closed by thin T-shaped strips of cast-iron, W. These spaces and the manner in which they are closed are shown in Figs. 2 and 3, and by the enlarged detail drawing, Fig. 8, and also less distinctly in Fig. 1.

F F, Fig. 1, (see also plan, Figs. 3 and 4,) are two of the system of pipes, (four in number,) one of which connects the steam-chamber A below the water-line with each section of the fire-pot, and (through the several smaller connecting-pipes, designated by the letter G, see Figs. 1, 2, 3, 4, and 5) with each segment of the horizontal sections. By these pipes water is conveyed from the steam-chamber A to all of the water-spaces within the fire-pot and horizontal sections. The pipes F and G should be sufficiently large to freely supply these water-spaces. The point of connection of a pipe, F, with the fire-pot is shown in Fig. 6 at F'. Connected with each pipe F is a drip-pipe (shown at H H in Fig. 1) with stop-cocks. By this means sediment in the boiler may be drawn off or the boiler entirely emptied.

The direction and action of the heat upon the water-sections (indicated by arrows in Fig. 1) is as follows: The heat (without regard now to its influence upon the perpendicular portion of the fire-chamber) is projected upward against the spherical parts of the fire-chamber immediately over the fire. Passing through the circular opening in the top of the fire-chamber, it strikes forcibly the under surface of the lowest of the horizontal sections C C at its center; thence flowing outwardly in all directions, and in close contact with that under surface to the outer edge of the same, it rises again perpendicularly against the second and larger horizontal section D D at its outer edge and on all sides; thence drawn again inward, hugging the surface of that section, it is projected through the opening in its center against the central portion of the third section C' C', and so on in the same manner it is directed against, along, and over the whole area of all of these horizontal sections or disks until it strikes the bottom of the steam-chamber A, around which it passes on all sides to the smoke-pipe J directly over its center.

For the purpose of providing a more direct and stronger draft, to be used to quicken a low fire, a smoke-pipe provided with a close-fitting damper may open into the boiler inclosure on a level just above the top of the fire-chamber, and running thence directly to the main smoke-pipe.

The boiler will be provided with the ordinary attachments—such as steam and water gages, safety-valve, automatic draft and check dampers, &c. It may be constructed of cast-

iron; but for all of the pipes mentioned ordinary steam-piping may be used. With slight modifications of form, to render construction more easy, it may be constructed of boiler-iron. If made of boiler-iron, the subdivision of the fire-pot and horizontal sections into component parts may be dispensed with. It may also be used for hot-water as well as for steam heating by dispensing with large steam-chamber A and using in its place one of the horizontal sections similar to C C, and by increasing a little the depth of the water-spaces and enlarging the pipes F and G, which will be connected with the return-pipes.

By the invention above described I claim to have accomplished the following objects:

First. Improved means are afforded of rapid and economical heating of water and converting the same into steam. To this end I avail myself of and apply in an improved manner the well-known principles that heat is most effective when in motion and forcibly projected directly against the surfaces to be affected; that its tendency is always perpendicularly upward, in which direction, therefore, its influence is most efficiently exerted, and that a small volume of water distributed over a large area is most rapidly heated and converted into steam. I have therefore distributed a small quantity of water in thin spaces over large areas, and, arranging the same in horizontal planes, or in planes opposed as far as possible to the direction of the current of the heat, have thus exposed the same immediately over the fire, and, in such a manner that the heat is projected directly against and is compelled to act most effectively upon the whole surface of the water-sections, as described, passing alternately from center to circumference and from circumference to center of the alternate sections.

Second. Constant and rapid circulation is provided and effected through all parts of the boiler, rendering it practicable and safe to reduce, as indicated, the thickness of the water-spaces and the volume of water employed.

Third. The employment of the horizontal sections, combined and connected in the manner shown, affords facility for increasing the capacity of the boiler to the extent of utilizing all of the heat produced by the simple addition of such sections. It renders easy, too, the replacing of parts if breakage should occur.

Fourth. By the division of the fire-pot and

the horizontal disks into component parts or segments, and connecting the same in the manner shown, aside from the advantages already set forth, greater strength is attained, provision is made for the expansive power of heat, and the whole structure is less rigid and yields, with less danger of breakage, to the influence of heat and cold. It facilitates the putting together of the structure, as explained above.

Fifth. Facility is afforded for cleaning all parts without difficulty, thus contributing to the effectiveness of the fire.

What I claim as my invention, and as being new, useful, and patentable as parts of a steam-boiler, is—

1. In a steam-generator, a series of alternating horizontal circular disks formed of separate segmental sections C, and annular disks formed of separate segmental sections D, and with an inclosing wall or casing, whereby the heat and products of combustion are caused to pass through and around said sections in a zigzag course and come in contact with all parts of the surfaces of said sections, substantially as and for the purpose hereinbefore set forth.

2. In a steam-generator, a series of alternately horizontal disks formed of separate segmental sections C, and annular disks formed of separate segmental sections D, each set of perpendicular sections connected by pipes E, and with an inclosing wall or casing, whereby the heat and products of combustion are caused to pass through and around said sections in a zigzag course and come in contact with all parts of the surfaces of said sections, and means provided for the circulation of the water in said generator, substantially as and for the purpose hereinbefore set forth.

3. In a steam-generator, a hollow fire-pot capable of holding water and steam formed of separate segmental sections B, with converging upper ends, whereby the products of combustion are caused to converge to the center of said fire-pot before passing therefrom, substantially as and for the purpose hereinbefore set forth.

Dated this 29th day of March, 1886.

DANIEL A. DICKINSON.

Witnesses:

H. S. WEBSTER,
C. N. WOODWARD.