

J. STRANG.  
Vertical-Flue Boiler.

No. 215,489.

Patented May 20, 1879.

Fig. 1

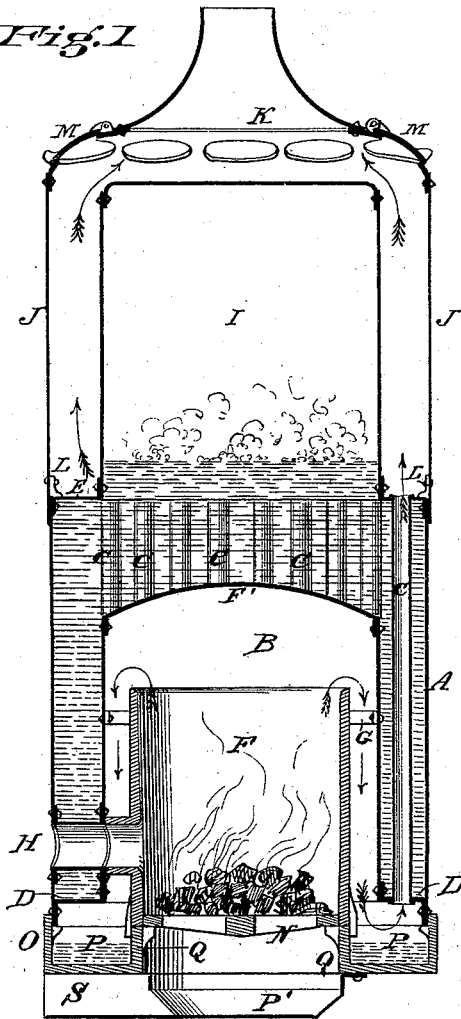


Fig. 2

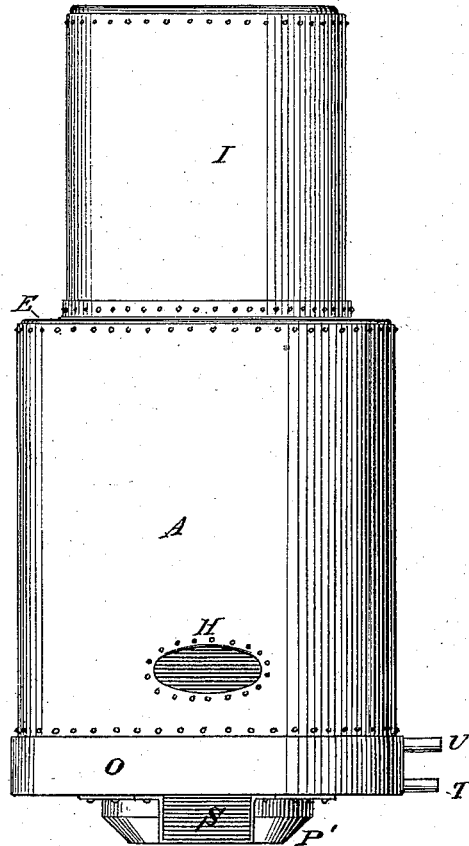
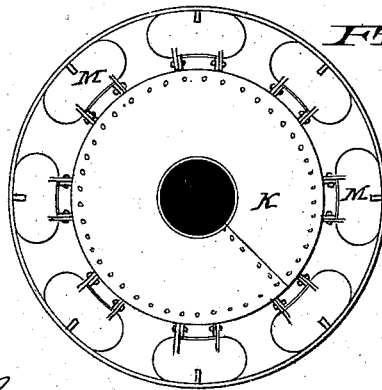


Fig. 3



Witness

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN VERTICAL-FLUE BOILERS.

Specification forming part of Letters Patent No. **215,489**, dated May 20, 1879; application filed  
January 18, 1879.

*To all whom it may concern:*

Be it known that I, JOSEPH STRANG, of Canton, in the county of Stark and State of Ohio, have invented a new and Improved Vertical-Flue Boiler; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of my improved generator. Fig. 2 is a front elevation with the smoke-jacket removed, and Fig. 3 is a top-plan view of the generator.

Similar letters of reference denote the same parts in the several figures of the drawings.

My invention relates to that class of steam-generators called "vertical-flue boilers," and has for its object to improve their construction and mode of operation by which they are adapted for burning straw as well as other fuel, their steam and water spaces enlarged, the flues protected, the crown-sheet and flues rendered easily accessible for cleaning, and the boiler, as a whole, made more complete and durable.

To this end the invention consists, first, in constructing the boiler in two parts of unequal diameters, the lower and largest part carrying the flues and fire-box, and the upper part forming a steam-dome surrounded by a smoke-jacket, having a bonnet with openings through which access may be had to the interior for cleaning the flues and top of the steam-dome, such jacket being removable, so that the head or crown-sheet of the fire-box can be cleaned through a man-hole in the steam-dome.

It also consists in the combination of a fire-pot with the fire-box and its surrounding flues to afford free passage for the products of combustion and leave the fire-box unobstructed by flues in order that the crown-sheet of the fire-box may be easily reached from below.

It also consists in the means by which the flues and top of the steam-dome can be cleaned from the top of the boiler.

It consists, lastly, in constructing the bottom of the boiler to form a water-pan which is adapted to be supplied with water from the heater or other source to operate as a spark-arrester at the base of the flues.

In the accompanying drawings, A is the lower cylindrical section of the boiler, preferably made of wrought-iron. B is the fire-box placed concentrically therein with its head or crown-sheet F' directly beneath the central opening in the upper flue-sheet, and C are the vertical flues extending from the bottom plate, D, to the top plate, E, within the water-space around the fire-box.

F is the fire-pot, made of cast-iron, fire-brick, or other suitable materials, so placed within the fire-box as to form a long annular diving-flue between them several inches in width and a passage over the top of the fire-pot under the crown-sheet F'. The fire-pot may be held in place by stays G from the walls of the fire-box or by other substantial means, and is accessible for fuel through a door, H, in the front of the boiler.

I is the upper section or steam-dome, made in form and material like the lower section, but of less diameter, so as to rest upon the flue-plate E over its central opening and inside the line of flues. The steam-dome is provided with a man-hole in the top, through which the crown-sheet of the fire-box can be reached, and it is surrounded by a sheet-iron smoke-jacket, J, having a cast or sheet iron bonnet, K, leading to the smoke-stack.

The smoke-jacket is slipped over the upper end of the lower boiler-section, and supported by a rib, L, or other device, in such a manner that it can be easily removed when necessary.

A series of openings, M, is formed through the top of the bonnet near the outer edge in line with the flues, and adapted to be closed by caps or a register. Each opening is large enough to uncover the ends of one or more flues for the introduction of a flue-brush by which the flues and top of the steam-dome can be cleaned.

By constructing the boiler as above described the vertical flues are entirely removed from the fire-box, leaving it unobstructed for reaching the crown-sheet, and by providing a supplemental fire-box the products of combustion are directed with full force against the crown-sheet, thence downward through the annular flue covering the whole length of the fire-box, and finally upward through the flues C, pass-

ing in their course to the smoke-stack and around the steam-dome, as indicated by the arrows, Fig. 1. The heating-surfaces are, therefore, very much increased beyond those of ordinary boilers of this class, and uniformly distribute the heat in the most effective manner.

In using straw for fuel, a large extent of heating and flue surface is necessary to fully utilize the heat; otherwise the flame, being very long, is liable to escape through the smoke-stack and set fire to surrounding objects, besides carrying off a large proportion of heat, which should be retained to heat the boiler. The great extent of heating and flue surfaces produced by my invention adapt the boiler for burning this kind of fuel, because they do not permit the long flame to pass through it until it has parted with its effective heat.

The steam-dome forms a very large and unobstructed steam and water space over the crown-sheet of the fire-box, and, combined with the smoke-jacket, produces a large and direct passage for the products of combustion which surround the steam-dome in their course to the smoke-stack, and further heat the steam within it, the smoke-jacket preventing the radiation of heat from the dome.

The crown-sheet F' can be readily cleaned by lifting off the smoke-jacket and opening the man-hole in the steam-dome for the introduction of a cleaning instrument.

N is the fire-grate, and P the bottom plate of the boiler. This plate is made of cast or sheet iron with an upturned edge-flange, O, to fit around the end of the boiler, a depressed center, P', forming an ash-pan, and an inner upturned flange, Q, surrounding the ash-pan and entering the lower end of the fire-pot or fitting snugly against it, to cut off communication at that point with the flues C. The depressed center constituting the ash-pan is reached through a trough, S, extending under the plate to the front of the boiler, as shown in Fig. 2. The annular space between the two flanges O Q lies under the flues C, and is filled or partially filled with water to catch and extinguish the sparks that may fall into it from the flame or fire passing into the flues. The water is supplied to the pan from the water-heater, usually placed beside the boiler, through a tube, T, entering the pan on a line with its bottom, and to prevent it from overflowing a drip-pipe, U, is inserted near the upper edge of the outer flange, as shown in Fig. 2. Each pipe should be provided with a cock to shut off or discharge the water when necessary. Other means may be employed for supplying water to the pan; but I prefer the arrangement described, as I regard it as the most simple and convenient.

I am aware that a boiler has been heretofore made having covered openings in the smoke-bonnet, through which the vertical flues and

sides of the steam-dome could be reached for cleaning; but the openings in the bonnet were arranged below the top of the dome, and such top could not therefore be reached through them. This arrangement I do not claim as any part of my invention.

I am also aware that a spark-trap has been combined with a vertical flue-boiler in such a manner that the products of combustion first pass upward from the top of the fire-box into the top of the boiler, thence downward into the trap, and lastly upward again to the top of the boiler, from whence they are discharged; but this arrangement forms no part of my invention.

Having thus described my invention, what I claim is—

1. The vertical-flue boiler consisting in the combination of the following parts, to wit: a lower cylindrical section, A, a fire-box, B, placed therein, a fire-pot, F, within the fire-box, a series of vertical tubes, C, surrounding the fire-box, an upper cylindrical section, I, of less diameter than the lower section and resting thereon and connected therewith below the water-line, and unprovided with flues, a smoke-jacket, J, surrounding the upper boiler-section, I, and supported upon the lower section, A, and a bonnet, K, provided with registered or covered openings, through which access is had to clean the flues in the lower section and the top of the upper section, substantially as described.

2. The smoke-jacket J and bonnet K, combined with the upper and lower boiler-sections, I A, which are connected below the water-line and with the vertical flue-tubes C in the lower section for the purpose of inclosing the upper section and permitting access to said flues and top of the steam-dome or upper section for cleaning them without removing the bonnet, substantially as described.

3. In a vertical-flue boiler, the upper section, I, of equal diameter with the fire-box, provided with a covered opening in its top, through which the crown-sheet of the fire-box is cleaned, in combination with the covered openings in the bonnet of the smoke-jacket, by which access is had to the vertical flues and top of the steam-dome, substantially as described.

4. The supplemental fire-pot F and the water and ash pan, combined with the fixed fire-box B and the vertical flue-tubes C, around the fire-box, by which a large annular space is formed within the fire-box, through which the products of combustion pass directly down into the water-pan before entering any of the flues in the water-space of the boiler, substantially as described.

In testimony of which invention I have hereunto set my hand.

JOSEPH STRANG.

Witnesses:

ORLANDO RANK,  
GEORGE REX.