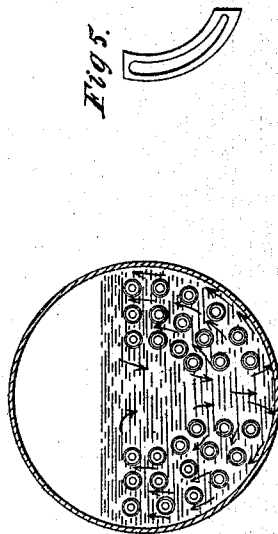
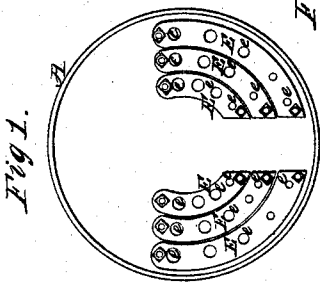
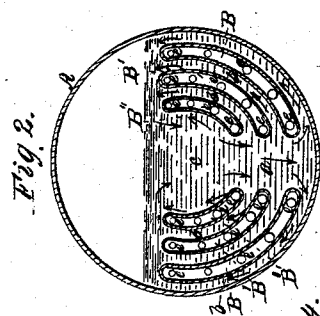
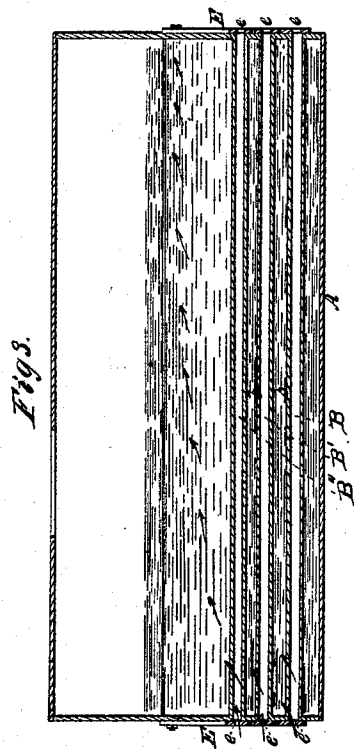


*P. N. Burke,*  
*Steam-Boiler Fire-Tube.*  
*N<sup>o</sup> 26,333.                      Patented Dec. 6, 1859.*



*Witnesses.*  
*L. M. Hughes*  
*Mich. Hughes*

*Inventor.*  
*P. N. Burke*

# UNITED STATES PATENT OFFICE.

P. N. BURKE, OF BUFFALO, NEW YORK.

## IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 26,333, dated December 6, 1859.

*To all whom it may concern:*

Be it known that I, P. N. BURKE, of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Steam-Boilers; and I do hereby declare that the following is 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 an end view of a horizontal boiler with my improvement. Fig. 2 is a transverse section of the same. Fig. 3 is a longitudinal vertical section of the same. Fig. 4 is a transverse sectional view of the boiler, exhibiting the invention somewhat modified. Fig. 5 exhibits a modification of the draft-distributing plates.

Similar letters of reference indicate corresponding parts in the several figures.

My invention relates to a novel arrangement of direct or return flues within the body of a boiler for the purpose of effecting economy of fuel, the rapid generation of steam after firing up, and the perfect circulation of the water in contact with the heating-surfaces of the flues and of the shell. It also consists in a certain system of draft-distributers employed in combination with such arrangement of flues for the purpose of producing an equable diffusion of heat over the whole surface of the flues.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is the cylindrical shell of the body of the boiler, and B B' B'', Figs. 2 and 3, are the flues running right through it in a horizontal and longitudinal direction. These flues have their transverse sections in the form of arcs, concentric, or nearly so, to the shell of the boiler, and there is an equal number on each side of the center of the boiler, the tops of said flues being all on the same level at a safe distance below the intended water-level, and their lower parts ranging in two vertical planes at short distances from a vertical plane passing longitudinally through the center of the boiler, so as to form an upright throat, *a a*, Fig. 2, between the lower parts of those on one side and the lower parts of those on the opposite side. These flues may be employed either as return-flues in connection with a fire under

the boiler, or as direct flues in connection with a fire under the boiler, or as direct flues in connection with a fire-box arranged in front, as in a locomotive-boiler. The operation produced by this arrangement of flues is as follows: The columns of water in the spaces *b b*, between the flues and the water on the outer sides of the outer flues, B B, and that in contact with the inner sides of the flues B'' B'', becoming heated, is caused to ascend, while the body of water in the central space, *c*, between the flues B'' B'', being less exposed to the action of the heat, and consequently cooler, descends through the upright throat *a*, to take the place of what has been carried up, thus producing a circulation, as indicated by arrows in Fig. 2.

E E, Figs. 1 and 3, are the draft-distributers, consisting of plates covering the ends of the flues, but provided with apertures *e e* for the escaping gaseous products of combustion. To illustrate the object of these distributers, it is necessary to explain that with almost any practicable arrangement of the fire-place and chimney the fire-place will be lower than the flues and the entrance to the chimney above them, and so the draft would naturally be strongest in the lower part of the flues at the end where they receive the products of combustion and in the higher part at the end where they make their exit; hence, supposing the left-hand end in Fig. 3 to be the receiving end and the right-hand end the escape end, the draft through the flues would naturally be in the direction of the arrows shown in that figure, if both ends of the flue were open the full extent of their transverse area, and the upper part of the flue at the left-hand end and the lower part at the other end would be left comparatively cool. The apertures in the distributers at the receiving end of the flues are made small at the bottom and larger toward the top, as shown in Fig. 1, and those in the distributers at the discharging end precisely the reverse, as shown in Fig. 2, where the said apertures are seen through the flues, and in this way the draft is equalized at the top and bottom at both ends and an equable distribution of heat over the whole surface of the flues is obtained. Instead of a series of apertures, *e e*, as shown in Figs. 1 and 2, a tapering slotted aperture may be provided

in each distributor, as shown in Fig. 5, the narrowest end of the said aperture being at the bottom of the receiving-distributor and at the top of the discharging one. The distributors should be so applied as to be capable of removal to permit the cleaning out of the flues.

Instead of the arc-formed flues B B' B'' shown in Figs. 2 and 3 several series of cylindrical tubular flues arranged in the form of arcs, as shown in Fig. 4, may be employed, and I regard such an arrangement of tubular flues as an equivalent of the arrangement of arc-formed flues first described.

What I claim as my invention, and desire to secure by Letters Patent, is—

The employment, in combination with flues arranged substantially as described, of draft-distributors E E, applied and furnished with apertures of varying size, substantially as herein specified.

P. N. BURKE.

Witnesses:

C. M. HUGHES,  
MICH. HUGHES.