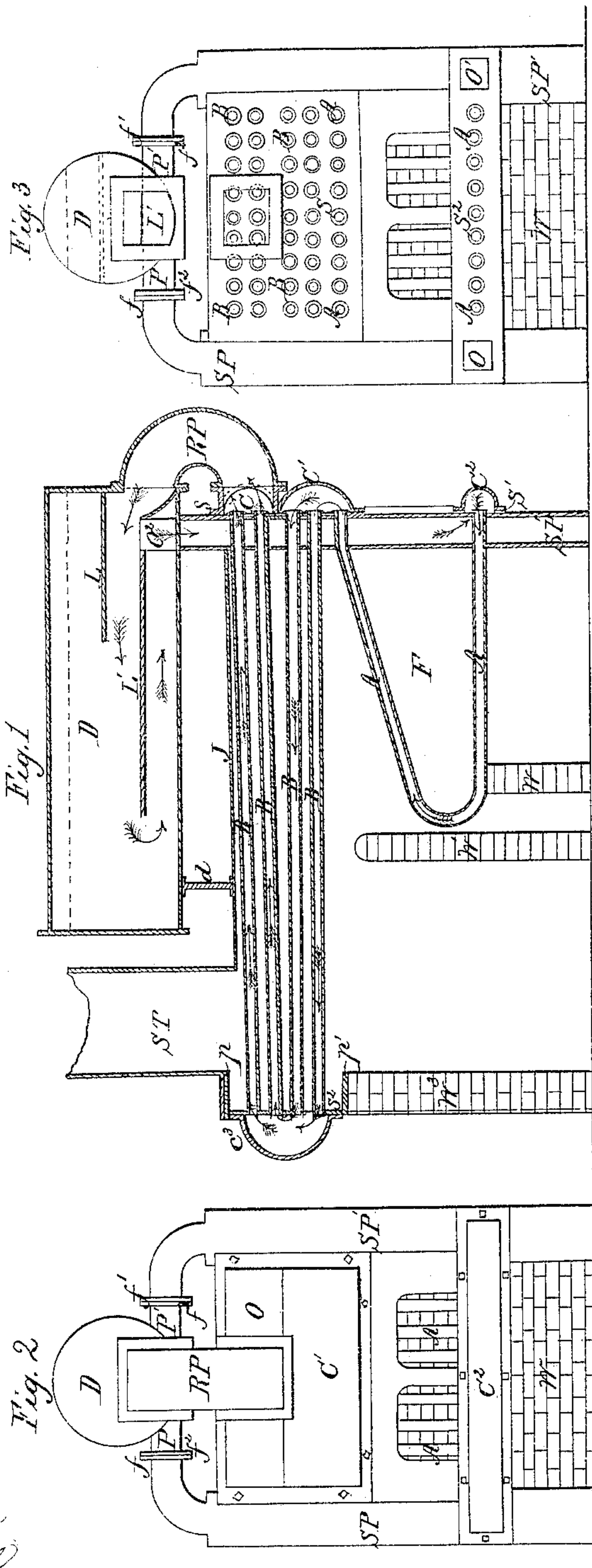


# *L. Pleyer*

## *Steam Generator*

*N<sup>o</sup> 94,767.*

*Patented Sept. 14, 1869.*



*Witnesses*  
*James R. Cabell*  
*W. Campbell*

*Inventor*  
*Leonard Pleyer*



# United States Patent Office.

LEONARD PHLEGER, OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 94,767, dated September 14, 1869.

## IMPROVEMENT IN STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, LEONARD PHLEGER, of the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in "Steam-Generators;" and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The object of my invention is to provide a steam-generator that will be secure from dangerous explosions, generate steam rapidly with a small quantity of fuel, maintain a rapid and perfect circulation of water, simple in construction, durable, and easy of access in case of cleaning or repairs.

My present improvement embraces some of the parts used in my "steam and hot air heating-apparatus," patented November 1, 1864.

The invention consists—

First, of a peculiar-formed furnace, composed of a series of curved tubes, in combination with a series of horizontal and inclined tubes.

Secondly, in securing the ends of the tubes into tube-sheets, to which are connected caps or water-ways, of a novel construction.

Thirdly, in arranging on each side of the tubes stand-pipes, which connect at the upper ends with a steam-drum, so that the ascending steam and water will separate in the drum, by means of shelves placed therein, and the water return to the lower series of tubes.

Fourthly, in forming a steam-generator so as to combine all the features hereinbefore set forth.

Figure 1 is a longitudinal section of my improvement in steam-generators.

Figure 2 is an end elevation.

Figure 3 is an end view with the caps removed.

The furnace F is composed of a series of tubes A, which form the grate-bars, and are curved somewhat in the form of the letter U.

The ends of the said tubes A are secured in the tube-sheets S, S<sup>1</sup>, and S<sup>2</sup>, and connect with a series of inclined and horizontal tubes, B B B B, by means of cast-iron caps or water-ways, C, C<sup>1</sup>, C<sup>2</sup>, and C<sup>3</sup>, fitted steam-tight to the sheets. The said caps enclose the ends of the tubes, and are made semicircular in form, and provided with flanges, through which pass bolts or rivets, for the purpose of securing them to the tube-sheets.

On each side of the tubes, and at the front end of the generator, are placed two stand-pipes, S P and S P', the upper parts of which are curved at right-angles, and provided with flanges f and f<sup>1</sup>, for the purpose of attaching them to the steam-drum D, placed above the tubes.

The tube-sheet S<sup>1</sup> is secured to the stand-pipes S P and S P', and connects with them by means of the openings O and O<sup>1</sup>. These openings are covered by means of the cap C<sup>2</sup>.

The steam-drum D is made of cast or wrought-iron, and of any suitable dimensions. The interior of said drum is provided with shelves, L and L', of different lengths, and placed one above the other, in order to more effectually separate the steam and water, and prevent foaming underneath the shelf L'. And near the front end of drum D are made square or other-shaped openings, O<sup>2</sup>. It is these openings which connect the steam-drum with the stand-pipes through the necks P and P', the said necks being provided with flanges, f<sup>2</sup> and f<sup>3</sup>, for securing them to the flanges f and f<sup>1</sup>.

The front end of the drum D is connected with the centre of the cap C, by means of the return-pipe or bend R P, as shown in figs. 1 and 2.

The front part of the shelf L' extends down, and is curved over the openings O<sup>2</sup>, so as to check and prevent the water from returning through the bend R P.

The tubes A, which form the furnace F, are supported at their rear end by means of the wall W. Immediately in the rear of this wall, is placed a wall, W<sup>1</sup>, for deflecting the flame and heat (passing between the tubes A) up and around the tubes B B B B.

The rear end of the generator rests upon a wall, W<sup>2</sup>, as shown in fig. 1, and is enclosed by side walls of ordinary construction.

The upper portion of the tubes B B B B is covered by means of a jacket or shell, J, said jacket being provided with an opening which connects with a smoke-pipe, S T. The rear portion of the drum D is supported by means of a standard, d, which rests upon the upper portion of the jacket J.

It will readily be seen, that by the peculiar arrangement of the tubes above described, that a perfect circulation will be maintained in them, whether the combustion be slow or rapid in the furnace, the steam and water passing in the direction shown by arrows in fig. 1, that is, from the front to the rear end of the tubes, and returning again to the front, from whence it passes to the steam-drum, where the steam and water separates, the steam passing to the upper part of the steam-drum in a dry state, and the water dropping and flowing beneath the plate L' to the front end of the drum, where it passes through the opening O<sup>2</sup>, and down the opposite stand-pipe to the cap or water-way C<sup>2</sup>, from whence it passes into the tubes A, immediately beneath the fire, and so continues to pass around and make a perfect circuit of the generator, preventing the accumulation of scale or sediment, and effectually overcoming priming or foaming.

The distribution of the tubes is such that all their



outer surfaces are made available as heating-surfaces, so that the ratio of the heating-surface per horse-power is greatly decreased, consequently generators of large or small power can be erected with a comparatively small number of tubes.

The cap  $C^3$  and tube-sheet  $S^2$  (to which the rear ends of the tubes B B B B are connected) slide in and out on plates  $p$  and  $p'$  as the tubes expand or contract, thus preventing leakage of the joints. The front ends of the tubes being riveted to wrought-iron sheets, are not subject to injury or leakage in expanding or contracting.

The generator is simple in all its parts, in order to be accessible in case of cleaning or repairs, and the tubes, owing to their smallness of diameter, are capable of withstanding a great pressure, hence the danger of a serious or general explosion is obviated.

Having thus described my invention, its construction and operation,

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The arrangement of the curved tubes A, in combination with horizontal and inclined tubes B B B B, substantially as and for the purpose specified.

2. The construction and arrangement of the caps or water-ways  $C$ ,  $C^1$ ,  $C^2$ , and  $C^3$ , placed over the ends of the tubes A, and secured to the tube-sheets  $S$ ,  $S^1$ , and  $S^2$ ; also, the arrangement of the plates  $p$  and  $p'$ , for the purpose of allowing the cap  $C^3$  and tube-sheet  $S^2$  to slide in and out, as and for the purpose specified.

3. The construction and arrangement of the return-bend R P, stand-pipes S P and S P', tube-sheet  $S^1$ , with openings O and O', steam-drum D, with shelves L and L', and necks P and P', so as to operate substantially as and for the purpose specified.

In testimony whereof, I have hereunto set my name, in the presence of two subscribing witnesses.

LEONARD PHLEGER.

Witnesses:

ISAAC R. OAKFORD,  
M. CAMPBELL.