G. Clark,

Steam Boiler.

No. 96,885. Patented Nov. 16. 1869.

Fig: 1.

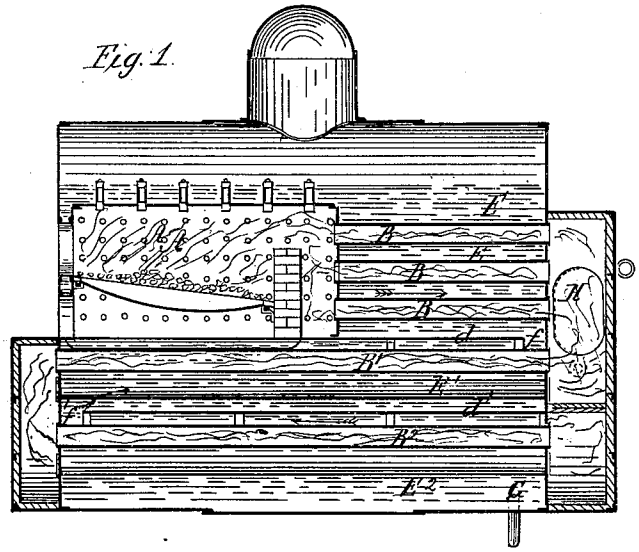


Fig: 2.

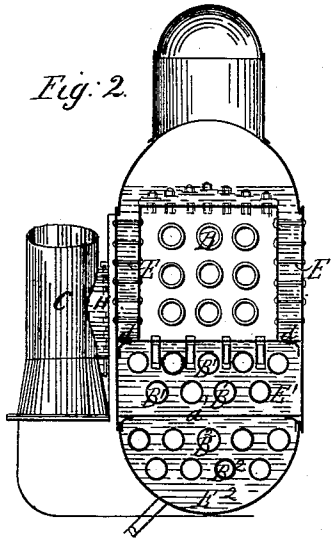
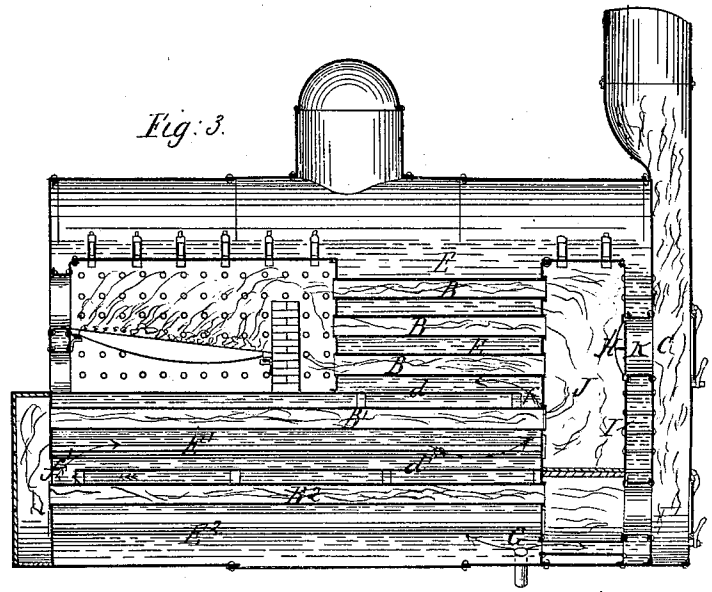


Fig: 3.



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GEORGE CLARK, OF BUFFALO, NEW YORK.

Letters Patent No. 96,885, *dated November* 16, 1869.

IMPROVEMENT IN STEAM-BOILERS.

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

I, GEORGE CLARK, of the city of Buffalo, in the county of Erie, and State of New York, have invented a certain new and useful Improvement in Steam-Boilers, of which the following is a specification.

In steam-generators, as ordinarily constructed, the water is heated and maintained at a uniform, or nearly uniform temperature throughout the different portions of the boiler.

In such case it is evident that when the temperature of the flues is reduced to nearly the temperature of the water surrounding them, the further absorption and utilization of heat therefrom cease.

The object of my invention is to utilize this waste heat.

The improvement relates to that class of boilers which is provided with return flues, arranged below the direct flues, so that the products of combustion are compelled to descend from one flue to the other, the lower flues being the last ones through which the draught passes before entering the smoke-stack.

My invention consists in so dividing the water-space of such a boiler, and arranging the mouth of the feed-water pipe, that it will open up into the boiler near the "up-take," and thereby compel the water, before it reaches the top, to circulate back and forth along the flues in a reverse direction from the draught within. This causes the temperature of the water to increase as it ascends, it being subjected to the most intense heat from the furnace near the top and steam-generating surface, while its temperature decreases toward the bottom as the heat of the flues diminish, until the flues through which the products of combustion last pass are surrounded by comparatively cold water, which continues to absorb the heat therefrom until they enter the smoke-stack.

In the accompanying drawings—

Figure I is a longitudinal vertical section of my improved boiler, with the up-take at one corner.

Figure II is a cross-section of the same.

Figure III a longitudinal section, with the up-take at the end of the boiler.

Like letters of reference designate like parts in each of the figures.

A represents the furnace.

B, the direct, B^1, the return, and B^2, the re-direct flues.

C, the up-take.

d d', two horizontal plates dividing the water-space into three compartments, E E^1 E^2.

The plate *d* is an extension of the bottom plate of the furnace, which reaches to near the rear end; a space, *f*, being left for the passage of the water from the middle to the upper compartment.

The diaphragm *d'* extends from the rear of the water-space to near the front end; a space, *f'*, similar to *f*, permitting free passage of the water from the lower to the middle compartment.

G is the mouth of the feed-water pipe, opening up into the boiler at the rear end, as shown.

In Figs. I and H, H is a damper, opening into the up-take at the rear of the direct flues, which can be opened, in firing up, so as to produce a direct draught to the smoke-stack, without the products of combustion passing through the return and re-direct flues.

Fig. III shows a form of boiler which may be used where there is not sufficient width of space for the arrangement shown in the other figures.

In this figure the up-take is at the end of the boiler, with a water-jacket, I, intervening it and a flue-chamber, J, at the end of the flues.

A passage, K, is provided through this jacket, closed by a damper, H', which permits of a direct communication to the up-take, similar to that afforded by the damper H, in Figs. I and II.

The direction of the draught through the different flues is shown by the wave lines, while the arrows denote the reverse course which the water is compelled to take to reach the top of the boiler.

The employment of the division-plates *d d'* has the effect to divide the boiler into two heating and one steam-generating space; the circuitous course which the water has to take preventing it reaching the upper compartment before being properly heated.

The effect of this is to prevent that reduction and change of temperature in the upper and steam-space which takes place on the introduction of a fresh suppply of water, as the ordinary general circulation from one compartment is prevented by the division-plates.

When the water-space is undivided, a more or less violent agitation is maintained, causing a constant circulation between the top and bottom, which carries up the dirt or other sediment in the water, and deposits it on the flues.

By my improved construction, this agitation at the bottom is prevented, while the slow horizontal movement of the water facilitates the deposition of the sediment on the bottom of the boiler or on the top of the lower diaphragm-plate.

This division of the water-space also renders the upper portion, which is subjected to the most intense heat, a superior steam-generating chamber, while the comparatively low temperature of the bot-

tom adapts it to most completely abstract the heat from the re-direct and return flues, thereby effecting a great saving of fuel.

What I claim, as my invention, is—

Dividing the water-space of a drop return-flue boiler by one or more diaphragms, and arranging the feed-mouth of the water pipe near the up-take, so as to compel a circulation of the water back and forth along the flues, in a direction reverse from that of the draught therein, substantially as and for the purposes hereinbefore set forth.

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