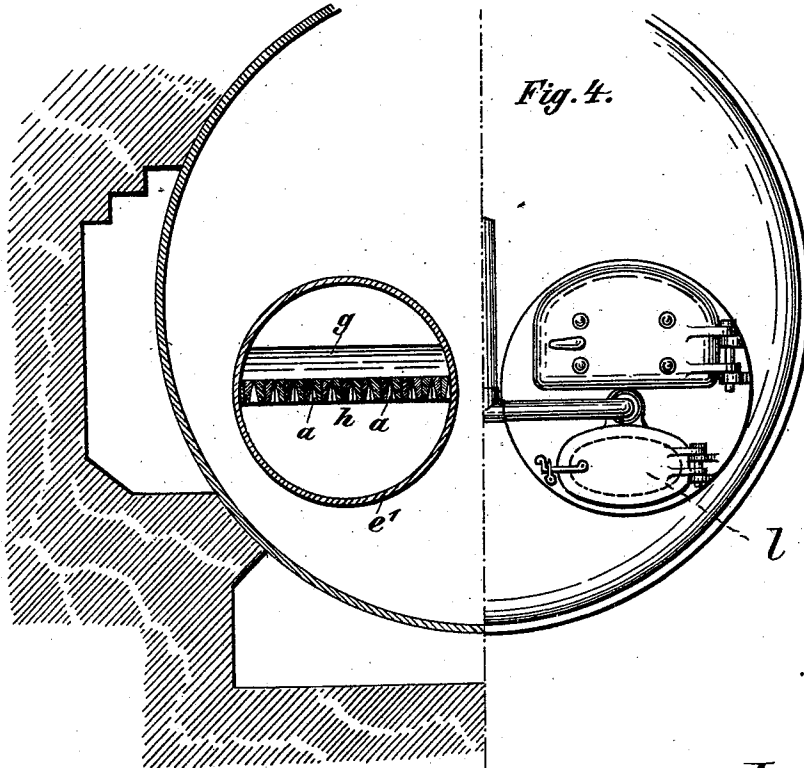
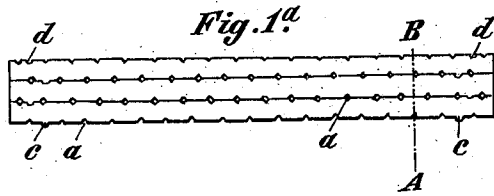
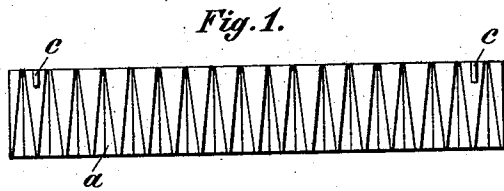


H. WILMS.  
STEAM BOILER FURNACE.

No. 523,824.

Patented July 31, 1894.



Witnesses:

Jesse Kingsbery  
Virgie Haugh

Inventor:

By Hermann Wilms  
Whitaker & Brewster, Atty.

H. WILMS.  
STEAM BOILER FURNACE.

No. 523,824.

Patented July 31, 1894.

Fig. 2.

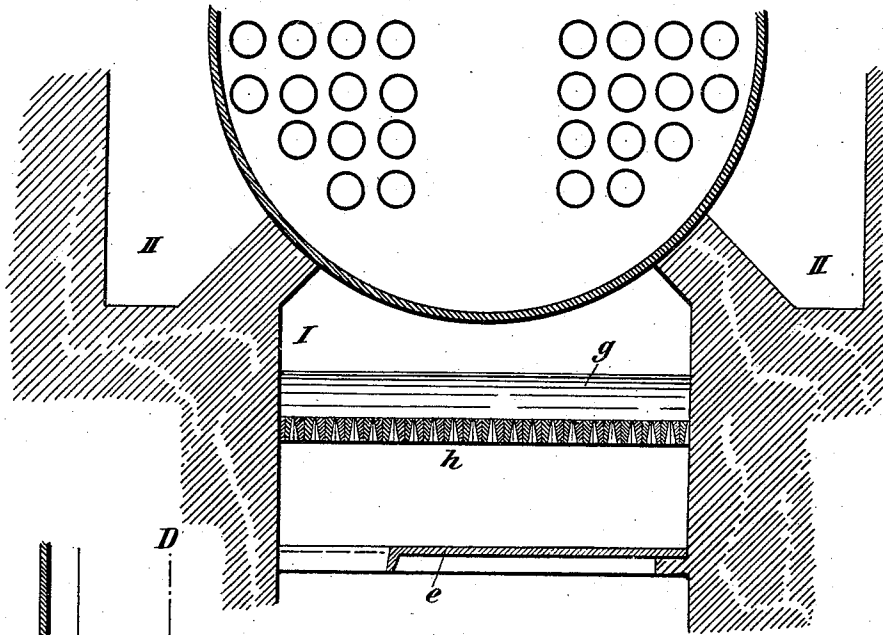
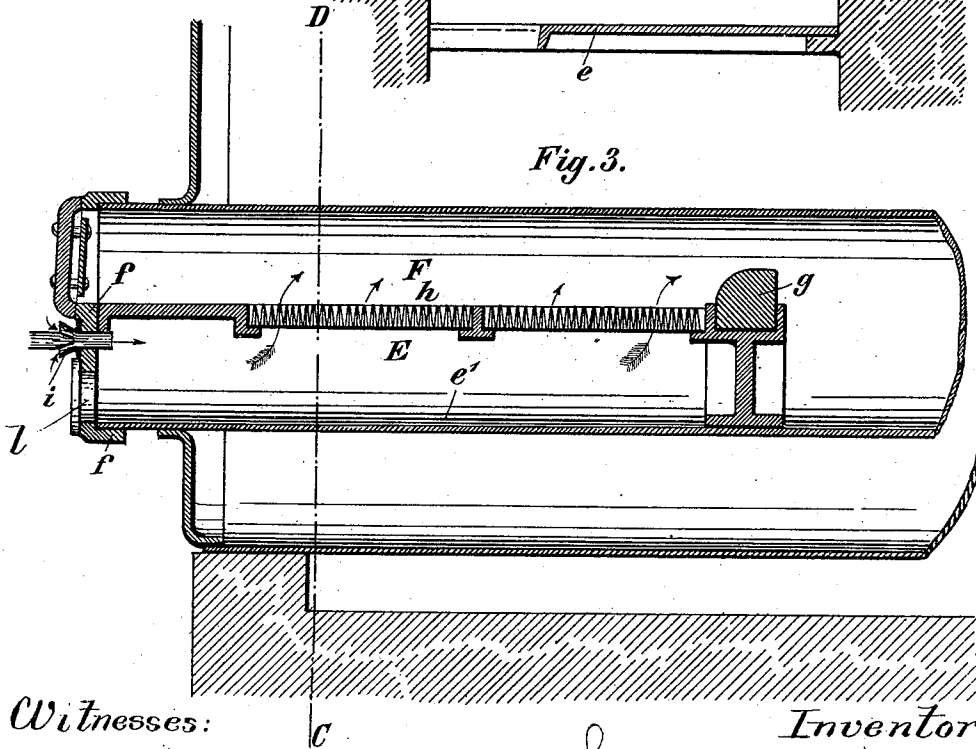


Fig. 3.



Witnesses:

Jesse Kingsbury  
Viggo Haugh

Inventor:

By Hermann Wilms  
Whitaker + Prevoost, Attys.

# UNITED STATES PATENT OFFICE.

HERMANN WILMS, OF COLOGNE, GERMANY.

## STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 523,824, dated July 31, 1894.

Application filed November 24, 1893. Serial No. 491,874. (No model.)

*To all whom it may concern:*

Be it known that I, HERMANN WILMS, merchant and manufacturer, of 11 Salier Ring, Cologne-on-the-Rhine, in the Empire of Germany, have invented new and useful Improvements in and Relating to Steam-Boiler and other Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to a furnace, more particularly designed for steam boilers, which has for its object to economically utilize pulverulent, granular and inferior fuel and waste, and, by continually introducing air under pressure, to produce as far as practicable a smokeless combustion. In this furnace it is not necessary to use expensive arrangements for introducing the air under pressure, the chamber which receives this air being formed directly by the masonry or the walls of the boiler and a closing plate. The grate consists of single exchangeable fire bars which, being placed side by side, constitute a very suitable grate surface for pulverulent or granular fuel. Through the free portion of the grate which consists of fine openings tapering upward between the several fire bars, the air under pressure is conducted to the fuel for the purpose of preventing the grate surface being clogged up or the fire bars baked together.

In the accompanying drawings illustrating how my invention may be conveniently carried into practice, Figure 1 represents a side view of a fire bar. Fig. 1<sup>a</sup> is a plan showing a set of fire bars. Fig. 1<sup>b</sup> is a vertical transverse section on the line A—B of Fig. 1<sup>a</sup>. Fig. 2 is a transverse section showing the application of my invention to a heating-tube boiler with external firing. Fig. 3 is a vertical longitudinal section representing how my invention may be applied to a flue tube boiler with internal firing. Fig. 4 on the left hand side represents a section on the line C D of Fig. 3, and on the right hand side a front view of the constructional form shown in Fig. 3.

The grate, Figs. 1, 1<sup>a</sup>, and 1<sup>b</sup>, is composed of single fire bars having upwardly tapering recesses *a* which when the fire bars are placed side by side form fine openings. Noses *c* provided on one side of each fire bar engage with

depressions *d* on the other side of the next fire bar and thus prevent the longitudinal displacement of the fire bars. These fire bars are like an ordinary plane grate, supported by the masonry in the case of externally fired boilers, as shown in Fig. 2, and by the flue tube in the case of internally fired boilers, as illustrated in Figs. 3 and 4. In front below the grate I provide, as shown in Fig. 2, a closing plate *e* forming a tight joint with the front plate of the furnace and also with the two sides of the masonry, which is obtained by simply filling in mortar between the edges of the said plate and the masonry. In the internally fired boiler represented in Fig. 3 the closing plate is formed directly by the lower front part *e'* of the flue tube. The fire-bridge *g* joins the grate in the known manner and the grate *h* in conjunction with the said fire bridge and the closing plate *e* or *e'* divides the combustion chamber into two compartments E and F situated one above the other, which compartments communicate with each other only through the openings *a* and are completely shut off from the outside. I arrange in the front plate *f* a nozzle *i* wherein a steam admission pipe *k* terminates through which regulated quantities of steam are injected into the lower compartment E. In this manner atmospheric air is drawn into the latter compartment, as indicated by arrows in Fig. 3, and is forced through the openings *a* in the grate. By the current of air the finely divided fuel is kept floating at some distance from the grate in the known manner and undergoes an energetic smokeless combustion. It will be readily seen that in this arrangement repairs will but rarely be necessary either for internal firing or for external firing. When this necessity arises it may easily and cheaply be effected by reason of the exchangeableness of the fire bars, while the whole furnace can be constructed at a very small cost. In like manner the operation of this furnace is very simple and economical.

When the fire is first lighted in the furnace a better fuel such as coke is put on the grate and the fire stirred and kept up by blowing in air as above described until it possesses the necessary energy. Then pulverulent, granular fuel or waste is introduced and the admission of air is regulated so that the fuel

floating above the surface of the grate is kept in continual motion and undergoes an energetic combustion.

5 In the front plate *f* is arranged an ash hole *l* with a door, through which the ashes may from time to time be removed from the compartment E.

10 The grate bars provided with rows of small apertures, tapering from bottom to top, have an important function in connection with forcing air under pressure into the air chamber beneath the grate. By this construction the air passes up through each of these tapering apertures, and is delivered with considerable force, as from a tapering nozzle, above the grate. This tends to keep the pulverulent material upon the grate in a state of suspension and enables it to be readily consumed.

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

A steam boiler for pulverulent material having a grate provided with a series of rows of cone shaped apertures increasing in diameter from top to bottom, forming upwardly tapering nozzles, a closed ash receptacle beneath said grate forming an air chamber and a steam injector for forcing air into said air chamber whereby the air is forced upward from said air chamber directly through said nozzles, under pressure, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HERMANN WILMS.

Witnesses:

FRITZ SCHRÖDER,  
EVA HAUSEN.