2 Sheets—Sheet 1.

A. WEBER.

FURNACES FOR DECOMPOSING STEAM.

No. 185,806. Patented Dec. 26, 1876.

Fig. 1.

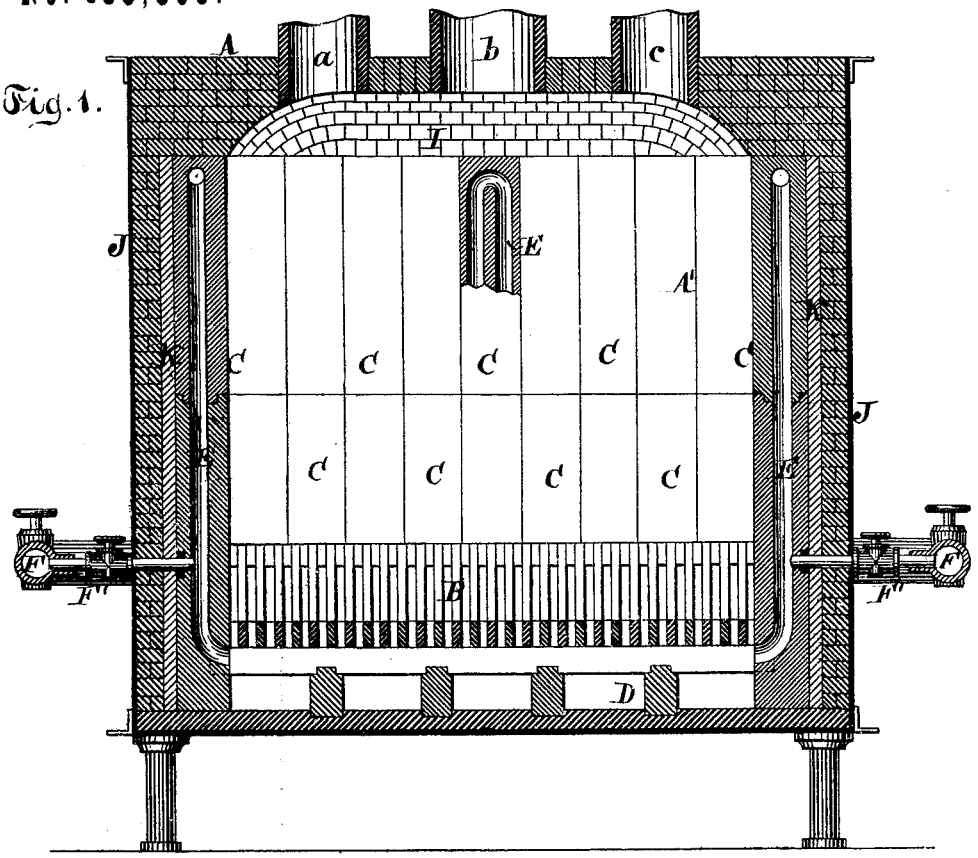
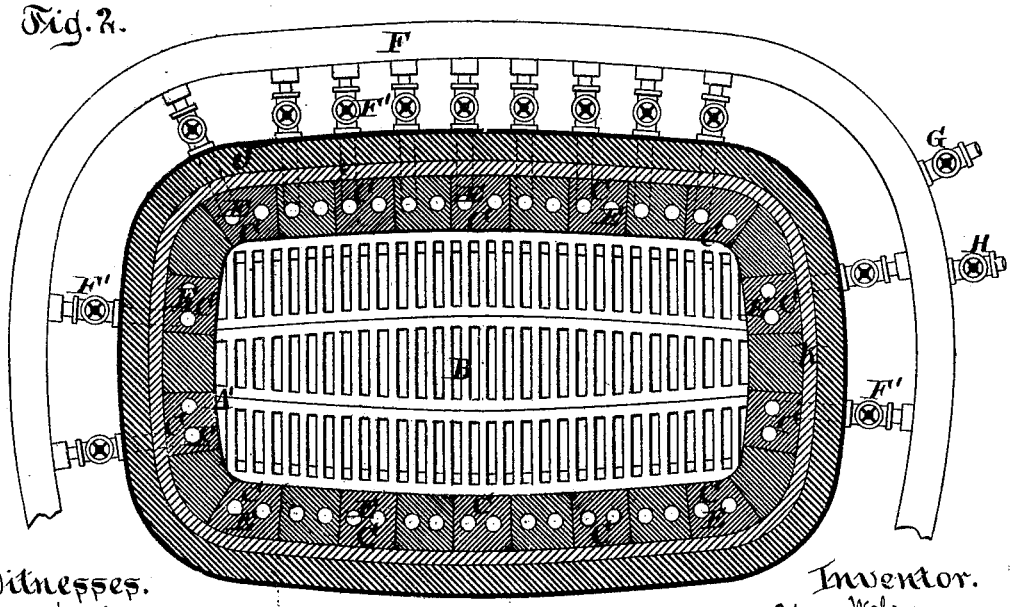


Fig. 2.



Witnesses.
Otis Hufeland
Chas. Wahlers.

Inventor.
Adam Weber by
Van Santvoord & Hauff
his attorneys

2 Sheets—Sheet 2.

A. WEBER.

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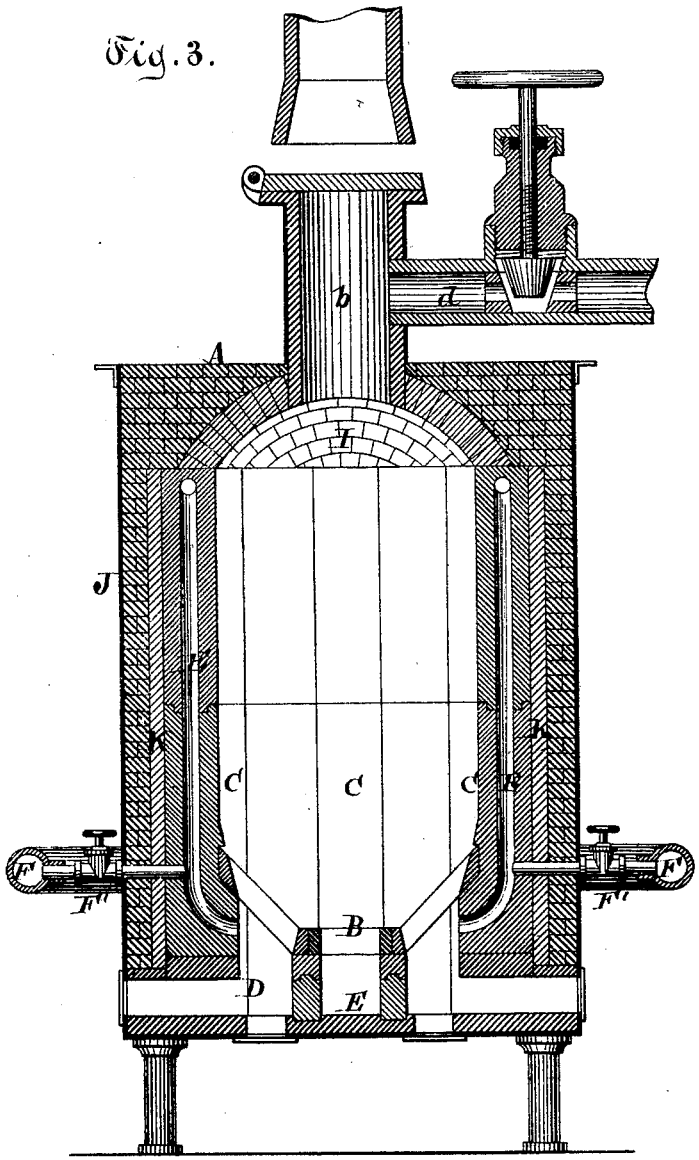
Fig. 3.



Witnesses.
Otto Hufeland
Chas. Wahlers.

Inventor.
Adam Weber
by Van Santwood & Hauff
his attorneys

UNITED STATES PATENT OFFICE.

ADAM WEBER, OF NEW YORK, N. Y.

IMPROVEMENT IN FURNACES FOR DECOMPOSING STEAM.

Specification forming part of Letters Patent No. **185,806**, dated December 26, 1876; application filed December 2, 1876.

To all whom it may concern:

Be it known that I, ADAM WEBER, of the city, county, and State of New York, have invented a new and useful Improvement in Furnaces for Decomposing Steam, which improvement is fully set forth in the following specification, reference being had to the accompanying drawing, in which—

Figure 1 represents a longitudinal vertical section. Fig. 2 is a horizontal section. Fig. 3 is a transverse vertical section.

Similar letters indicate corresponding parts.

The object of this invention is to provide a simple and economical apparatus for decomposing steam, by passing the same through an incandescent mass of carbonaceous matter.

My invention consists in the combination of a furnace containing a decomposing-chamber lined with fire-bricks, return-channels running up and down in said lining-bricks, and opening into the space beneath the grate of the furnace; a pipe which embraces the furnace, and is provided with branch pipes, which communicate one with each of the return-channels; and two supply-pipes—one for air and the other for steam—both connected to the pipe which embraces the furnace, all the pipes being provided with suitable stop-cocks, so that the supply of air or steam to each of the return-channels can be regulated, and that by injecting the heated air beneath the grate of the furnace the combustion of the charge in the decomposing-chamber is promoted, and by injecting the superheated steam beneath the grate said steam is compelled to pass through the entire charge of the decomposing-chamber, and its complete decomposition is insured.

In the drawing, the letter A designates a furnace, which is provided with a grate, B. Above this grate is situated a decomposing-chamber, A′, which is lined with fire-bricks C. The grate is, by preference, made basket-shaped, or with a depression in its middle, so that the charge will have a tendency to work down toward the lowest portion of the grate, and that the ashes are free to discharge through the spaces between the grate-bars, leaving said spaces open for the passage of air or steam. The ashes which pass through the grate-bars accumulate in the ash-chamber D, from which they are either raked out through doors in its sides, or from which they may be dumped through suitable doors in its bottom. When the furnace is in operation, all these doors must be firmly closed and luted, to prevent the escape of gases and the entrance of external air.

In the fire-bricks C, which form the lining of the heating-chamber A′, are formed channels or ducts E, which, in the example shown in the drawing, are made in the form of return-channels, running up and down through the fire-bricks in vertical directions, the fire-bricks containing said ducts or channels being retained in the proper relation toward each other by tongues and grooves, as shown in Figs. 1 and 3 of the drawing. One branch of each of the return-channels opens beneath the grate B, while its other branch connects with a pipe, F, that extends all round the furnace, and is provided with a series of branch pipes, F′, one for each of the return-channels. Each of these branch pipes is provided with a stop-cock, so that the communication between the pipe F and each of the return-channels E can be controlled. The pipe F connects, by means of a pipe, G, with a reservoir containing compressed air, and, by means of a pipe, H, with a steam-generator. Both these pipes are provided with stop-cocks, so that they can be opened or closed at will.

The top of the generating-chamber is closed by an arch, I, which is provided with three (more or less) openings, *a b c*, through which the charge is introduced. The opening *b* communicates with the chimney and with a pipe, *d*, the chimney serving to carry off the gaseous products of combustion, while the products resulting from the decomposition of the steam are carried off through the pipe *d*.

Between the outer wall J and fire-bricks C is a layer, K, of plaster-paris or other suitable material, to reduce the loss of heat by radiation.

The furnace is charged with anthracite coal, peat, coke, or other carbonaceous matter; and after the charge has been ignited, the air-blast pipe G and all the branch pipes F′ are opened, and, by the action of the blast injected through the return-channels E beneath the grate, the charge is soon brought to a high state of combustion.

As the temperature of the charge is raised, the air in its passage through the return-channels E becomes highly heated, and the heat of the charge in the decomposing-chamber is rapidly raised to the highest possible point. During this stage of the operation, the communication between the opening *b* and the chimney is open, and the gas-escape pipe *d* is closed. When the charge has become heated to a white heat, the air-pipe G is closed, and immediately thereafter, or as soon as all the oxygen of the air in the decomposing-chamber has been consumed, the communication between the opening *b* and the chimney is closed, and the steam-pipe H and the gas-escape pipe *d* are opened. The steam thus admitted to the pipe F passes through the return-channels E, where it becomes superheated, and in this state it is caused to pass through the incandescent carbonaceous matter contained in the decomposing-chamber. In its passage through the incandescent mass the superheated steam becomes decomposed, the hydrogen gas contained therein being set free, while the oxygen gas enters into combination with the carbon contained in the decomposing-chamber, forming carbonic oxide. The gases thus evolved pass off through the pipe *d*, and they are finally purified and used for heating or illuminating purposes. By the action of the steam the temperature of the charge in the decomposing-chamber is reduced, and when it has reached a red heat, the steam-pipe H and the gas-pipe *d* are closed, the communication between the opening *b* and the chimney is opened, and a fresh supply of air is injected through the return-channels, and after the charge has been again brought to a white heat, the air-pipe is closed and the steam-pipe is opened, and so on.

It will be readily seen from this description that, by injecting air below the grate of the furnace, the combustion of the charge is materially promoted, and the steam, being also injected beneath the grate, is compelled to pass through the entire charge, so that no part thereof is liable to escape without being decomposed. Furthermore, by running the heating-channels E up and down in vertical directions, I am enabled to connect each heating-channel by a separate branch pipe with the pipe F, which connects with the steam and air pipes, the air and the steam passing through said heating-channels are heated to a uniform temperature, the operation of the apparatus is rendered simple and economical, and a uniform product of decomposition is obtained. In practice the ducts or channels are enameled inside, to prevent leakage through the pores of the fire-bricks; or, if desired, metallic pipes may be placed into said channels.

I do not claim in this application the combination of heating-channels formed in the bricks which form the lining of the decomposing-chamber, and provided with openings leading into said decomposing-chamber, with air and steam pipes, through which air and steam are alternately admitted to said heating-channels, since this combination forms the subject-matter of a separate application for a patent.

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

The combination of a furnace containing a decomposing-chamber lined with fire-bricks, return-channels running up and down in said fire-bricks, and opening into the space beneath the grate of the furnace; a pipe which embraces the furnace, and is provided with branch pipes, which communicate with each of the return-channels; and two supply-pipes—one for air and the other for steam—both connected to the pipe which embraces the furnace, all constructed and operating substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 22d day of November, 1876.

ADAM WEBER. [L. S.]

Witnesses:
W. HAUFF,
OTTO HUFELAND.