

UNITED STATES PATENT OFFICE.

GIDEON BANTZ, OF FREDERICK CITY, MARYLAND.

FURNACE FOR HEATING STEAM-BOILERS, &c.

Specification forming part of Letters Patent No. 20,616, dated June 22, 1858; Reissued February 6, 1872, No. 4,731.

To all whom it may concern:

Be it known that I, GIDEON BANTZ, of Frederick city, in the county of Frederick and State of Maryland, have invented a new and Improved Furnace for Heating Steam-Boilers and other Apparatus; 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 a part of this specification, in which—

Figure 1, is a longitudinal vertical section of the furnace, showing its application to a steam boiler. Fig. 2, is a transverse vertical section through the fire chambers in the plane indicated by the line *x, x*, of Fig. 1. Fig. 3, is a transverse vertical section through one of the reverberatory chambers, in the plane indicated by the line *y, y*, of Fig. 1.

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

The object of this invention is the more perfect combustion of tan, saw dust, bagasse, and all other kinds of refuse fuel in a wet or dry state, as well as of wood or coal. It is however with particular advantage to the burning of wet fuels.

My invention consists in the arrangement embracing, for united use, in the manner and for the purposes hereinafter specified, the following features, to wit; 1st. Two or more arched fire chambers with throats of less area than their capacity. 2nd. An auxiliary combustion reservoir or chamber with *cyma reversa* shaped bottom and side draft door. 3rd. A series of reverberatory chambers with side draft doors and passages at top for communication with each other, and 4th a diving or direct flue leading into the chimney or smoke stack.

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

A, A, are two arched fire chambers arranged side by side, furnished with grates *a, a*, and having ash pits B, B, provided below the said grates. These fire chambers are not spaced below the boiler H, but directly in front thereof and longitudinally parallel therewith. They may, however, be placed at one side of the boiler, and at any angle to it. Each is provided with the usual door *b*, but these are only used for lighting the fires, and the ash pits are provided with

doors *c*, to regulate the supply of air through the grates and permit the cleaning out of ashes. On the top of each chamber there are feeders *d, d*, for supplying the fuel, but as these feeders are the same as used in other furnaces, no particular description of them is necessary. The fire chambers are covered with a flat floor built over the arches, that the fuel may be wheeled to the feeders in barrows or brought in any other convenient manner.

At the rear end of each fire chamber, there is a throat like aperture *e*, communicating with what I term the reservoir C, which is built of brick lined with fire brick under the front portion of the boiler, and which has a concave bottom *m*, and convex back *n*, which are formed by a *cyma reversa* shaped plate. By having the bottom and back of the reservoir formed by a *cyma reversa* shaped plate, the throat *e*, is not partially closed up as it would be if the plate was straight and set inclined, and beside this the heated products of combustion are made to hug the bottom of the boiler and as the draft is at this point, the perfect combustion of partially ignited gases is insured. The convex back of the reservoir terminates in and serves as a bridge wall, and has a concave top, so formed as to leave a space *o*, of but three or four inches between it and the boiler. The purpose of the reservoir will be presently explained. In rear of the bridge wall *f*, there is a series of reverberatory chambers D, D, D, two, three or more, one behind the other, the series extending nearly as far as the rear end of the boiler, and the said chambers being severally separated by bridge walls *g, g*, and each chamber being provided with one or more doors *h*, in either or both sides for the purpose of admitting air in sufficient quantities either to complete the combustion of the gases from the fire chambers or to check the draft. The reservoir is furnished with a door *h'*, for a similar purpose as those *h, h*, in the reverberatory chamber. At the rear of the hindmost reverberatory chamber there is a wall *g'*, like *g, g*, behind which there is a diving or drop flue E, leading to the chimney.

The operation of the furnace is as follows: The gaseous products of the combustion in the fire chambers A, A, escape by the throats *e, e*, into the reservoir C, where they mingle

together and the combustible portion thereof becomes ignited and where their heat acts upon the boiler, and from whence they pass into one after another of the reverberatory chambers in each of which a portion of their heat is abstracted by contact with a portion of the boiler and finally they descend the flue E, to the chimney. The effect of the principal portion of my improvement which consists in the employment of the reservoir C connected with the fire chambers by the throats *e, e*, of much smaller transverse area than the fire chambers, is that the products of combustion and heat are prevented leaving the fire chambers too rapidly, and the said chambers are consequently caused to be heated to an intense degree, and a very nearly perfect combustion of the fuel is obtained therein and when the gaseous products of combustion leave the fire chambers by the said throats and arrive in the reservoir C, the side walls and curved bottom and back of which are kept at a white heat, the still combustible portion of the gaseous product is ignited under the boiler.

In the management of the furnace, care should be taken to supply the charges of fuel to the two fire chambers alternately as nearly as possible at regular intervals so that in one there may be always a bright fire. At night or at any time when no steam is required from the boiler or when the generation of heat is not required, the two front feeders should be filled up with fresh fuel, the ashpit doors closed up, and one or more

of the doors *h, h*, opened to prevent more than a very limited supply of oxygen to the fire chambers so that such a degree of heat may be kept that on the doors *h, h*, being closed and the ash pit doors opened, to let the fire burn briskly, the boiler or other apparatus heated, by the furnace may be at once ready for operation. The doors *h, h*, in the reverberatory chambers besides being used to admit cool air in sufficient quantity to prevent draft and keep the fire damped may be also employed to admit air in more limited quantities to effect the combustion in the reverberatory chambers of any inflammable gases that may pass the reservoir C.

It is proper to state that instead of two fire chambers, three or more may be used, the same being constructed and arranged in the same manner and all communicating with the same reservoir, each by a contracted throat *e*.

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

The arrangement of fire chambers A, A, contracted throats *e, e*, auxiliary combustion reservoir C, provided with the cyma reversa bridge plate *m, n*, and door *h'*, reverberatory chambers D, D, with doors *h, h*, and the diving or direct flue E, substantially as and for the purposes set forth.

Washington June 5, 1858.

GIDEON BANTZ.

Witnesses:

J. M. HARDING,
GEO. KANTNER.