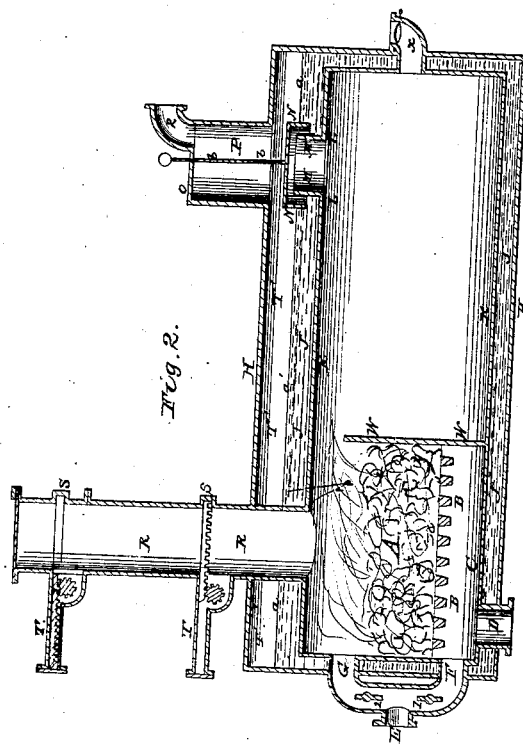
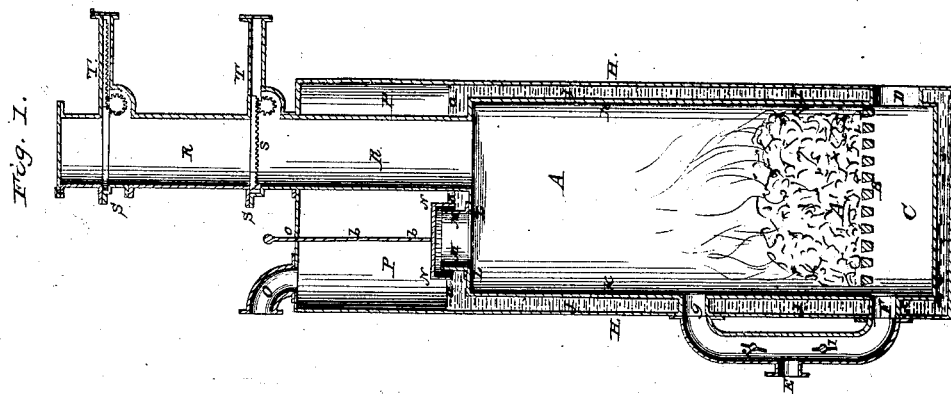


P. Bennet,
Steam-Boiler Furnace.

Nº 870.

Patented Aug. 3, 1838



UNITED STATES PATENT OFFICE.

PHINEAS BENNET, OF NEW YORK, N. Y.

APPARATUS FOR GENERATING STEAM.

Specification of Letters Patent No. 870, dated August 3, 1838.

To all whom it may concern:

Be it known that I, PHINEAS BENNET, of the city of New York, State of New York, have invented certain Improvements in the Mode of Applying the Gaseous Products of Combustion to Generating of Steam and to Aid in Giving Motion to Steam-Engines; and I do hereby declare that the following is a full and exact description thereof.

10 In my engine, the furnace is to be made air tight, and the air by which the combustion of the fuel is to be effected, is to be forced into said furnace under a very considerable degree of pressure, by means of blowing cylinders, or other competent blowing apparatus to be worked by the power of the engine. The air so forced in may be carried wholly through the fire, being introduced below the grate bars; or a portion of it may be made to pass into the furnace near to the surface of the burning fuel, for the purpose of causing the entire combustion of the smoke, and the combustible gases which escape from the fuel; this introduction of the air is to be regulated by suitable valves, in a way to be presently described. The highly heated gases thus produced, consisting principally of carbonic acid gas and nitrogen, are to be made to pass through a part of the water of the boiler, thus communicating a portion of this heat thereto, and, consequently, aiding in the production of steam therefrom; after which, these gases enter the cylinder with the steam, and cooperate therewith by the elasticity consequent upon their high temperature, in operating the engine. I regulate the passing of the heated gases through the water by means of what I denominate a cap-valve.

40 The furnace, which in Figure 1 in the accompanying drawing, is represented in the form of a vertical cylinder, is surrounded by water, contained in a space left for that purpose, between the cylindrical case of the boiler and the cylindrical furnace. The top-plate of the furnace has an opening through it into the steam-chamber above it, which opening is surrounded by a neck or collar, rising above the surface of the water in the boiler, the water covering the top plate of the furnace, to the height of two or three inches, more or less. The cap-valve, which is an inverted cylindrical box, passes over the neck or collar, above named, its edges dipping into the water, but standing at a sufficient distance from the neck, or collar,

to allow a passage to the heated gases. By means of a sliding rod, the cap may be raised or lowered, and is capable of being brought into close contact with the top plate of the boiler to which it is accurately fitted.

It is necessary, in my furnace, to feed the fire without disturbing the pressure required therein for the due action of the engine, and this I effect in the following manner:— Upon the top plate of the boiler, I erect a tube, or cylinder, like the ordinary chimney, or flue, of a boiler, which cylinder, so erected constitutes, with its appurtenances, my fuel reservoir. I place a shutter horizontally, and sliding steam tight, across the reservoir, close, or near, to the top plate of the boiler, and a second shutter at such heights above this as may be rendered necessary by the nature and quantity of the fuel to be used. When the lowermost of these shutters is closed and the upper one open, the fuel is passed into the reservoir, and the upper shutter closed. On opening the lower shutter, the fuel will fall into the furnace without the internal pressure, due to the forcible blast, being thereby disturbed. To facilitate the sliding of these shutters, the pressure upon each side of them may be equalized by establishing a communication by means of a tube, regulated by a stop-cock, between the interior of the fuel reservoir and the boiler, or the furnace; and also between said reservoir and the surrounding atmosphere; the use and operation of the apparatus so arranged will be obvious to every engineer. The ashes produced by the combustion of the fuel, fall into a closed ash-pit, into which there is to be an opening closed by a valve, shutter, or cock, by the opening of which, the ashes may be readily removed when necessary. They may if desired, be blown out, by employing the condensed gases in the furnace to operate through an opening, closed by a valve, for that purpose. There is to be a draft hole, opening into the ash-pit, which is left open for the purpose of kindling the fire, and getting up the steam, and which is to be perfectly closed when the blast is on. The same opening may be used for blowing off, or otherwise removing, the ashes, or they may be distinct from each other, as may be preferred.

In the accompanying drawing, Fig. 1 is a vertical section of the furnace, the boiler, and their appendages.

A, A, is the interior of the furnace; B, B, the grate, and C, the ash-pit.

D, is the draft hole, which is to be kept open while lighting the fire, and getting up steam, but which is to be securely closed when the blowing apparatus is in motion.

E, is the opening for the introduction of the blast, communicating by means of the tubes F and G, with ash-pit C, or with the furnace at, or near, the upper part of the burning fuel.

H, H, is the shell, or case, of the cylindrical boiler, containing water in the space I, I, I, between it and the shell of the furnace K, K.

The top plate of the furnace is shown at L, L, with its openings surrounded by the neck, or collar, M, M, this collar, rising above the water line *a, a*.

N, N, is the cap-valve attached to the rod *b, b*, which rod passes through a stuffing box in the top plate O, of the boiler.

P, P, constitutes the steam chamber, Q being the steam pipe.

The cap-valve may be loaded in any required degree, or it may be raised and lowered by means of a screw or other device, according to the force of the blast, and other circumstances. Its lower edge is turned and ground so as to fit closely against its seat upon the upper side of the top-plate S, S, of the furnace.

R, is the fuel reservoir, the cylinder constituting which, is continued down and descends through the steam chamber of the boiler, uniting with the top plate of the furnace, as seen in drawing.

S, S, are the sliding shutters which are shown as provided with racks and pinions, for the applying of sufficient force by means of a winch to pass them into, or out of, the recesses T, T, prepared to receive them.

Instead of the upper shutter, I sometimes cover the top of the reservoir with a round plate *b*, which plate, or cover, may be turned around upon a screw, or pin, *c*, when fuel is to be inserted, and be replaced and screwed down before the lower shutter is opened. This plate must, of course, make a perfect joint with the cylinder.

When used on locomotive carriages, for the purpose of traveling upon railroads, it will be most convenient to place the cylindrical boiler and furnace horizontally; and this will also be preferred in other situations. In Fig. 2 I have shown the manner in which the respective parts may be arranged when the boiler is so placed, and it will be seen that the principle upon which I proceed is still maintained throughout, no other change being made than that which is rendered necessary by its new position. In this figure, the same letters of reference are

used to designate like parts, as are employed in Fig. 1; and they will not need, therefore, to be again described; but I will proceed to point out such particulars as may not be obvious upon inspection. As the steam chamber extends along the cylinder, when it is placed horizontally, a larger space is allowed between the two cylinders, at the upper side I', I', than is requisite at the lower, I, I, which then admits of sufficient room above the water line, *a, a*, for the steam chamber. The draft hole, D, is represented as on the under side of the cylinder, below the ash pit; it may, however, be in the end, or side, and other changes may be made, so far as respects form and location, without in any way departing from the principle of action.

W, W, is a partition between the fire chamber and the hot-air chamber of the furnace, which partition extends up to a sufficient height to sustain the fuel, and to direct the draft up through it, the heated gases passing over it, a sufficient space being allowed for that purpose.

H is a flue through which the smoke is allowed to escape when the fire is first lighted; a similar flue is, usually, placed in the vertical furnace, but is not represented in the drawing.

I have thus fully described all the essential parts of my steam engine, and have shown what I esteem the most convenient manner in which the respective parts thereof may be arranged, without intending thereby to limit myself on such points, my invention not being dependent upon any particular arrangement of the parts; but

What I do claim as constituting my invention, and for which I desire to obtain Letters Patent is—

1. The construction and employment of an air tight furnace, in to which air is to be blown under considerable pressure; combining with said furnace the cap valve above described, with its appendages, or any other similar apparatus, so constructed as to operate substantially in the manner set forth.

I do not claim the air tight furnace, with its blast, independently of the above named combination.

2. I likewise claim in combination with such a furnace and cap valve, or any analogous apparatus, an air tight reservoir for fuel, constructed in the manner and for the purpose of supplying the furnace with fuel without interfering with the pressure from the blasts by which the combustion is kept up.

PHINEAS BENNET.

Witnesses:

A. F. JOHN,
CHARLES E. HURDY.