(No Model.)

W. TOMILSON.

FURNACE.

No. 458,295. Patented Aug. 25, 1891.

Fig. 1.

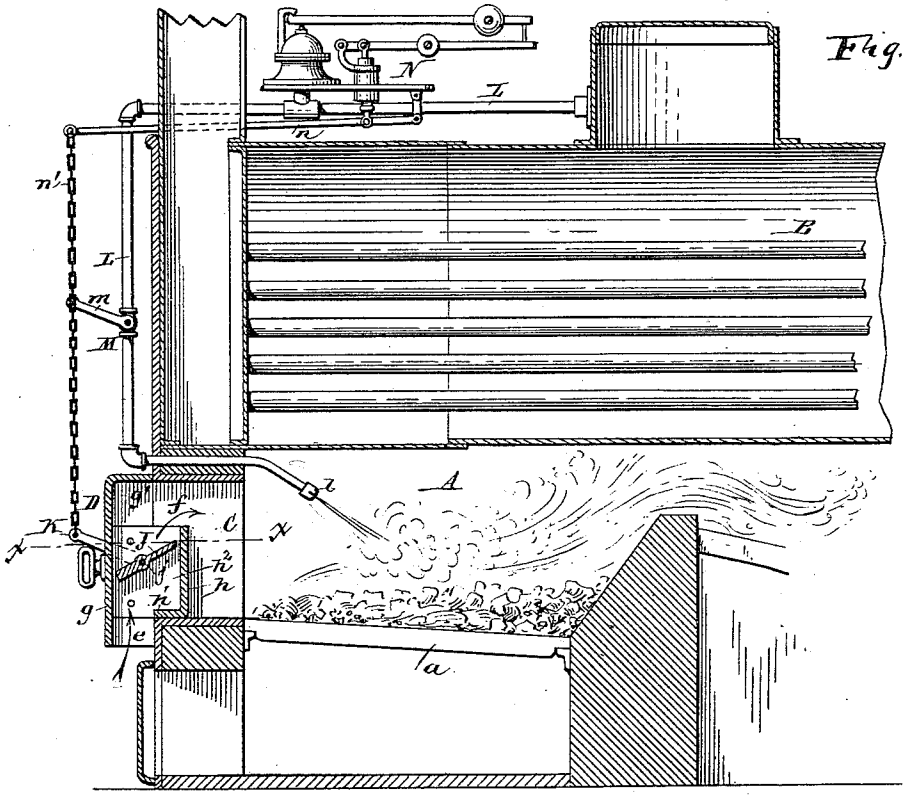


Fig. 2.

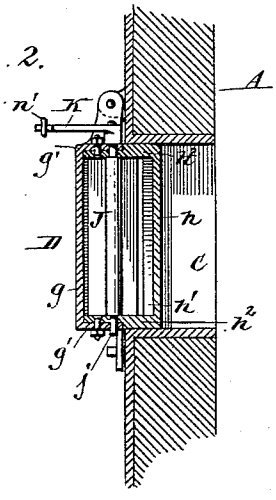
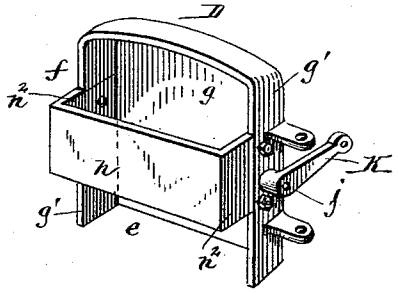


Fig. 3.



Witnesses:
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM TOMILSON, OF BUFFALO, NEW YORK, ASSIGNOR OF ONE-HALF TO GILBERT S. GRAVES, OF SAME PLACE.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 458,295, dated August 25, 1891.

Application filed February 21, 1891. Serial No. 382,299. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM TOMILSON, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to that class of smoke-consuming devices by which air and steam are delivered over the fire and mingled with the smoke for consuming the latter.

My invention has the objects to provide means whereby the air is heated before it is delivered over the fire, and also to automatically control the supply of air and steam to the fire.

In the accompanying drawings, Figure 1 is a fragmentary sectional elevation of a steam-boiler and its fire-box provided with my improvements. Fig. 2 is a horizontal section in line $x\,x$, Fig. 1. Fig. 3 is a perspective view of the fire-door.

Like letters of reference refer to like parts in the several figures.

A represents the fire-box, a the grate, and B the steam-boiler.

C represents the stoke-hole of the fire-box, and D the fire-door by which it is closed. This door is provided with an air-passage having an inlet-opening e at its bottom outside of the fire-box for the admission of external air and an outlet-opening f at its upper end, which communicates with the interior of the fire-box and through which the air is delivered over the fire for supplying the oxygen necessary to consume the smoke. The door is preferably constructed of two sections. The outer section consists of a front wall g, having marginal flanges g' formed along its top and side edges. This outer section bears with its side and top flanges against the front of the fire-box, while its lower edge is separated from the front of the fire-box by the opening e, through which the air is admitted to the passage of the door. The inner section of the door consists of a rear wall h, having a horizontal bottom flange h' and vertical side plates h^2 h^2, arranged at right angles to the rear wall. The rear wall projects into the stoke-hole some distance in rear of the front wall g when the door is closed and extends upwardly from the bottom of the stoke-hole to about two-thirds of its height, thereby leaving an opening between the top of the rear wall h and the top of the stoke-hole for the passage of the air into the fire-box. The side plates h^2 of the rear wall extend forwardly and are secured to the vertical side flanges of the outer wall by means of bolts or rivets, the overlapping parts being preferably reduced in thickness to form a flush finish when the parts are connected. The bottom flange h' of the rear wall extends outward and rests on the bottom of the stoke-hole, thereby forming a support for the door when closed. The rear wall of the door is arranged sufficiently close to the fire of the furnace to become intensely heated. This causes the air in passing upwardly through the passage between the front wall and the rear wall to become thoroughly heated and to be delivered over the fire at the proper temperature for effecting the consumption of the smoke in the fire-box.

J represents a damper arranged in the air-passage between the front and rear walls of the door, whereby the amount of air supplied to the fire-box is regulated. This damper is secured to a rock-shaft j, journaled in the side plates of the door and provided outside of the door with a rock-arm K. The pivot of the damper may be arranged out of center, or one of its wings may be weighted, so that the damper has a tendency to open when free to move.

The stoke-hole door is provided on one side with hinges and on the opposite side with a latch.

L represents a steam-pipe passing from the steam-dome of the boiler through the front wall of the fire-box. The end of the steam-pipe arranged in the fire-box is bent so as to incline downwardly and provided with a slitted or perforated nozzle l, whereby a thin sheet or spray of steam is delivered over the fuel on the grate. The steam and heated air in passing over the fire commingle with the rising smoke and produce therewith a combustible mixture, which is readily consumed.

M represents a valve arranged in the steam-

pipe, whereby the supply of steam to the nozzle is controlled, and *m* is a rock-arm secured to the stem of said valve.

N represents an automatic regulator of any desirable construction, whereby the supply of steam and air delivered over the fire is regulated. This regulator is preferably provided with a flexible diaphragm of ordinary construction and with a rock-lever *n*, actuated by said diaphragm in the usual manner. The regulator is preferably mounted on or connected with the steam-pipe leading to the fire-box. The free end of the regulator-lever is connected with the arms *m* of the steam-valve and the arm K of the air-damper arm J by a chain or rod *n'*, whereby the movement of the regulator-lever is transmitted to the steam-valve and air-damper. When the steam-pressure in the boiler drops below the normal, the arm of the regulator descends and permits the steam-valve and the air-damper to open, thereby delivering a spray of steam and a current of heated air over the fire. Coal being now thrown upon the fire, a large quantity of smoke is produced, which rises and commingles with the incoming air and steam, thereby forming an inflammable gas, which is readily consumed. When the fire ceases to give off smoke and the heat of the fire has raised the steam-pressure in the boiler sufficiently high, the steam-pressure raises the arm of the regulator, and the latter in turn raises the arms of both the steam-valve and air-damper, thereby shutting off the supply of steam and air above the fire.

It is necessary to supply steam and air above the fire only when supplying fresh fuel, which generates smoke. When the fire is low, the steam-pressure goes down and the pressure-regulator opens both the steam-valve and air-damper. The hissing noise produced by the issuing steam serves as a signal for the fireman and indicates to him that the steam-pressure is low and the fire requires a fresh charge of coal. It is desirable to allow a small quantity of steam to pass through the steam-pipe and nozzle, even when no smoke is formed and the steam-pressure is high, in order to prevent the intense heat in the fire-box from burning off the nozzle. The steam-valve is therefore so constructed that it allows a small quantity of steam to pass through it when it is shut. By connecting the air-damper and steam-valve with an automatic regulator the supply of air and steam to the fire is automatically controlled and waste of fuel is avoided. Air is admitted to the space underneath the grate in any usual manner.

I claim as my invention—

1. The combination, with the fire-box provided with a stoke-hole, of a hollow door closing said stoke-hole, said door having a vertical front wall provided with a flange at its top and sides bearing against the boiler-front, while its lower edge is separated from the boiler-front by an opening, a rear vertical wall extending from the bottom of the stoke-hole upwardly within a short distance of the top of the latter, and side plates formed on the rear wall and connected with the side flanges of the front wall, and a damper pivotally arranged between the front and rear walls of the door, substantially as set forth.

2. The combination, with the steam-boiler and its fire-box, of a hollow door provided with an opening in its bottom for the admission of air and an opening in its top for the discharge of the air into the fire-box, a pivoted damper arranged in said hollow door, and an automatic regulator communicating with the steam-boiler and connected with said damper, substantially as set forth.

3. The combination, with the steam-boiler and its fire-box, of a hollow door provided with an opening in its bottom for the admission of air and an opening in the top for the discharge of the air into the fire-box, a pivoted damper arranged in said hollow door, a steam-pipe provided with a discharge-nozzle in the fire-box, a valve arranged in said pipe, and an automatic regulator communicating with the steam-boiler and connected with said valve and damper for controlling the supply of steam and air to the fire-box, substantially as set forth.

Witness my hand this 17th day of February, 1891.

WILLIAM TOMILSON.

Witnesses:
THEO. L. POPP,
FRED. C. GEYER.