

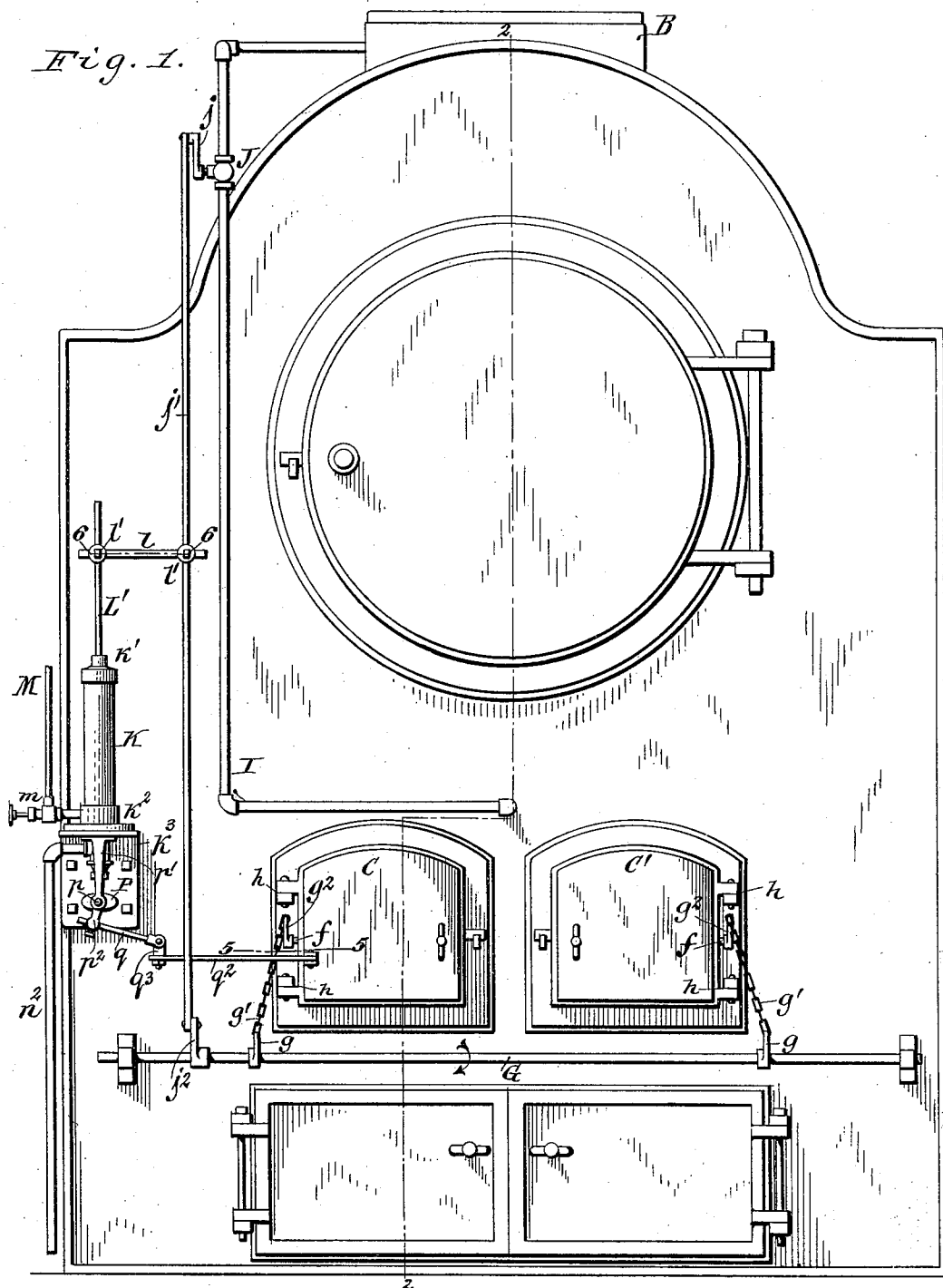
(No Model.)

W. TOMILSON.
FURNACE.

2 Sheets—Sheet 1.

No. 591,993.

Patented Oct. 19, 1897.



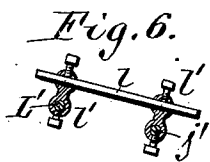
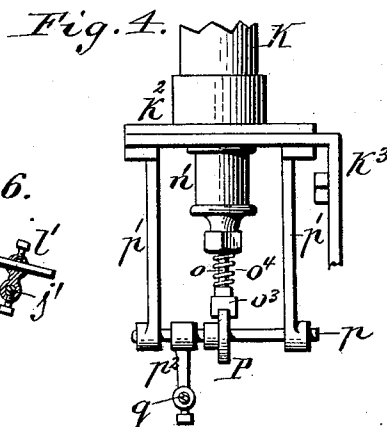
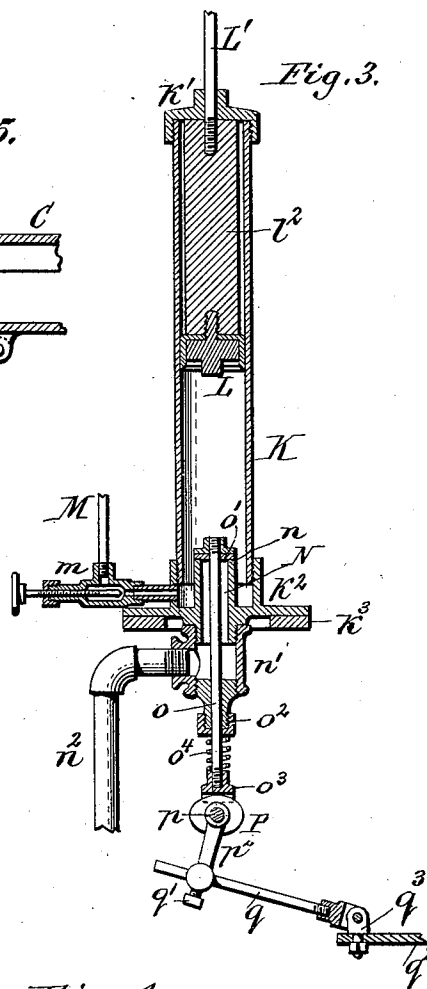
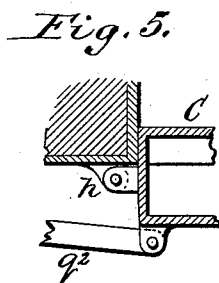
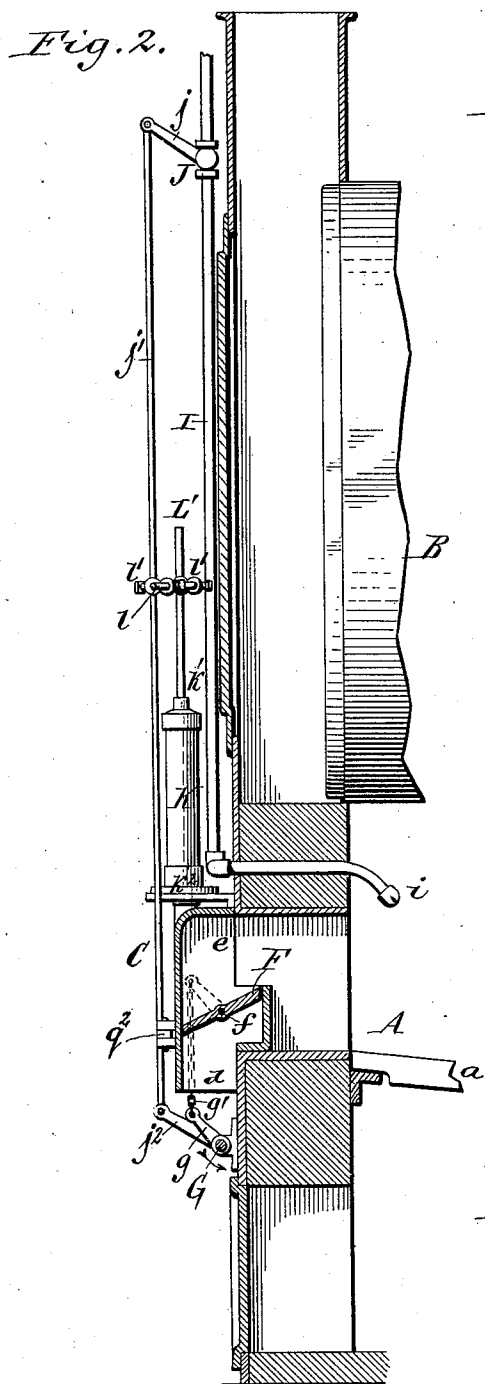
Witnesses:
Henry L. Deck.
F. Gustav Wilhelm.

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Attorneys.

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. 591,993, dated October 19, 1897.

Application filed May 28, 1897. Serial No. 638,556. (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 a new and useful Improvement in Furnaces, of which the following is a specification.

This invention relates to that class of smoke-consumers for furnaces which deliver air and steam over the bed of fire whenever the fuel is replenished for the purpose of forming an inflammable mixture with the smoke which rises from the fire.

The object of my invention is to produce a simple and reliable device whereby the supply of air and steam are automatically controlled and which can be easily adjusted for varying the duration of the air and steam supply after new fuel has been added to the fire.

In the accompanying drawings, consisting of two sheets, Figure 1 is a front elevation of a steam-boiler provided with my improvements. Fig. 2 is a fragmentary vertical section thereof in line 2 2, Fig. 1. Fig. 3 is a vertical section, on an enlarged scale, of the regulator-cylinder and connecting parts. Fig. 4 is a fragmentary side elevation of the lower portion of the same viewed at right angles to Fig. 3. Figs. 5 and 6 are fragmentary horizontal sections in lines 5 5 and 6 6, Fig. 1, respectively.

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.

CC' represent the fire-doors, which close the stoke-holes, and each of which is provided with an air-passage having an inlet *d* at its bottom outside of the fire-box for the admission of air and an outlet *e* at its upper end which communicates with the interior of the fire-box. The amount of air passing through each fire-door is regulated by a valve or damper F, which is pivotally supported by means of a horizontal rock-shaft *f*, which is journaled in the side walls of the fire-door. The damper is arranged out of center on the shaft or may be weighted so that it con-

stantly tends to close the air-passage in the door.

G represents a horizontal rock-shaft journaled in bearings on the boiler-front below the fire-doors and provided with two rock-arms *g g*, which are connected by chains *g' g'* with rock-arms *g² g²* on the outer ends of the damper rock-shafts. Upon turning the rock-shaft G in the direction of the arrow, Figs. 1 and 2, the dampers are turned so as to open the air-passages in the doors, and upon turning the rock-shaft in the opposite direction the dampers return to their closed position by gravity. Each fire-door is connected on one side with the boiler-front by the usual hinges *h* and on its opposite side by a latch.

I represents a steam-pipe extending from the steam-dome of the boiler through the front wall of the fire-box and provided above the front portion of the grate with a perforated spraying-nozzle *i*. The steam issuing from the nozzle and the air entering through the fire-door pass over the fire and commingle with the smoke rising from the fire and produce a combustible mixture which is readily ignited and burned.

J represents a valve arranged in the steam-pipe and controlling the supply of steam to the spray-nozzle. The stem of this valve is provided with an arm *j*, which is connected by a connecting-rod *j'* with a rock-arm *j²* on the rock-shaft G, whereby the air-dampers and steam-valve are simultaneously opened and closed.

When the fire-doors are opened for delivering a fresh charge of fuel into the fire-box, the air-dampers and steam-valve are automatically opened and held in this position after the doors are again closed a sufficient time to supply the necessary air and steam for completely consuming the smoke rising from the fuel. The automatic mechanism whereby this is accomplished is constructed as follows:

K represents an upright cylinder provided with upper and lower heads *k' k²* and supported by means of a bracket *k³*, which connects the lower head of the cylinder with the boiler-front.

L is a piston arranged in the cylinder and

provided with a piston-rod L' , which passes upwardly through the upper cylinder-head. The outer portion of the piston-rod is connected in any suitable manner with the vertical connecting-rod j' of the steam-valve and air-dampers, preferably by a short horizontal bar l , secured to the piston-rod and vertical rod j' by clamps l' . The weight of the piston and connecting parts tends to move the piston toward the lower end of the cylinder and this tendency is preferably aided by weighting the piston, as shown at l^2 , although the same effect can be produced by the use of springs. When the piston is lowered, the air and steam valves are open and when the same is raised these valves are closed.

M represents a pressure-pipe which communicates with the lower end of the cylinder and whereby a fluid or gas under pressure—such as water, steam, or air—is introduced into the lower end of the cylinder for raising the piston and closing the air and steam valves. This pressure-pipe is provided with a valve m for regulating the admission of fluid into the cylinder.

N represents an outlet-passage formed in the lower cylinder-head and provided at its inner end with an inwardly-facing valve-seat n while its outer end is connected by a T-coupling n' with a waste-pipe n^2 .

o is a longitudinally-movable valve-stem arranged vertically in the outlet-passage and provided at its inner or upper end with a waste or outlet valve o' , which is adapted to rest on the valve-seat n for closing the outlet-passage. The lower portion of the valve-stem passes through a stuffing-box o^2 on the lower end of the T-coupling and is provided at its lower end with a bifurcated head o^3 . The outlet-valve is normally held in a closed position by means of a spring o^4 , which surrounds the valve-stem and bears with its ends against the lower cylinder-head and the bifurcated head of the valve-stem. The outlet-valve is opened by a rotary cam P , engaging with the head of the outlet-valve stem and mounted on a horizontal rock-shaft p , which is journaled in hangers p' , arranged on the lower cylinder-head.

p^2 is a depending rock-arm which is secured to the cam rock-shaft and which is connected with one of the fire-doors, so that upon swinging the latter on its hinges the cam will be rocked and the outlet-valve opened or closed. The connection between the fire-door and the cam rock-arm is preferably made so as to be capable of adjustment, and consists of a bar or rod q , adjustably secured at an angle to the cam rock-arm by a set-screw q' , a link or bar q^2 , pivoted at one end to the adjacent fire-door outside of the hinges of the latter, and a swivel q^3 , connected with the rock-arm bar q by a horizontal pivot and with the link by a vertical pivot. When the fire-door C is closed, the cam is so turned that its low or receding portion is presented to the outlet-

valve stem, which permits the latter to descend and close the outlet-valve. When the valve is in this position, the incoming fluid from the pressure-pipe fills the lower portion of the cylinder and raises the piston so that the air and steam valves are closed. Upon opening the fire-door C the cam is turned so as to bear with its salient or high portion against the outlet-valve stem, whereby the outlet-valve is raised from its seat and the contents of the cylinder are permitted to discharge into the waste-pipe, thereby allowing the piston to drop and opening the air and steam valves. After the fuel has been thrown on the fire the fire-door C is again closed, whereby the cam is returned to the position which permits the outlet-valve to rest on its seat. The water from the pressure-pipe now gradually fills the lower portion of the cylinder and raises the piston so as to close the air and steam valves. The steam and air valves remain open a sufficient time to consume all of the smoke rising from the fire, and as this time varies according to the kind of fuel and other conditions the closing movement of these valves may be varied by adjusting the regulating-valve m in the pressure-pipe so as to reduce or increase the time required for filling the cylinder, thereby closing the air and steam valves slower or faster. The outlet of the cylinder is sufficiently large to permit the water to discharge rapidly from the cylinder and open the air and steam valves quickly. When the outlet-valve is open, the water from the pipe M , which is constantly under pressure and runs slowly, passes off through the outlet, thereby allowing the air and steam valves to remain open fully until the outlet-valve is closed by the fire-door, after which the water continues to flow only until the cylinder is filled and the piston has been raised to its highest position for closing the steam and air valves.

As shown in the drawings, the regulating mechanism is operated only by one of the fire-doors, this being sufficient inasmuch as both fire-doors are usually opened together and a charge of fuel is introduced through both stoke-holes at the same time, but if desired a separate regulator may be connected with each fire-door.

I claim as my invention—

1. The combination with a pipe or passage adapted to deliver a smoke-consuming medium into the fire-box, and a valve whereby said pipe or passage is controlled, of a piston whereby said valve is actuated, a cylinder in which said piston is arranged, an inlet admitting the actuating fluid to said cylinder, an outlet and outlet-valve, and means whereby said outlet-valve is opened upon opening the furnace-door, whereby the actuating fluid is allowed to escape from said cylinder by opening the outlet-valve, allowing the piston to follow and thereby opening the valve in said pipe or passage, while upon closing the

outlet-valve of the cylinder the actuating fluid again accumulates in the same and forces the piston forward, which latter finally closes the valve in said pipe or passage, substantially as set forth.

2. The combination with the fire-box and the fire-door, of a pipe or passage adapted to deliver a smoke-consuming medium into the fire-box and provided with a valve, a cylinder having an inlet for a pressure fluid at one end and an outlet at the same end, a piston arranged in said cylinder and connected with said valve, an outlet-valve adapted to open and close said outlet, and a connecting device between the outlet-valve and the fire-door whereby said outlet-valve is operated by the movement of the door, substantially as set forth.

3. The combination with the fire-box and the fire-door, of a pipe or passage adapted to deliver a smoke-consuming medium into the fire-box and provided with a valve, a cylinder having an inlet at one end for a pressure fluid and an outlet at the same end, a piston arranged in said cylinder and connected with said valve, an outlet-valve adapted to open and close said outlet, a cam whereby said outlet-valve is shifted, and a connecting device

between the cam and the fire-door whereby the cam is moved by the door for opening and closing said outlet-valve, substantially as set forth.

4. The combination with the fire-box, the fire-door provided with an air-passage, the air-valve arranged in said passage and the steam-pipe opening into the fire-box and provided with a valve, of a vertical cylinder provided at its lower end with an inlet and an outlet, a piston arranged in said cylinder and connected with the air and steam valves, a fluid-pressure pipe connected with the inlet of the cylinder and provided with a regulating-valve, an outlet-valve adapted to open and close said outlet and provided with a valve-stem, a rock-shaft provided with a cam engaging with said valve-stem, a rock-arm arranged on the rock-shaft, and a link connecting the rock-arm with the fire-door, substantially as set forth.

Witness my hand this 22d day of May, 1897.

WILLIAM TOMILSON.

Witnesses:

THEO. L. POPP,
ELLA R. DEAN.