O. G. WARNKE.

SMOKE PREVENTER.

APPLICATION FILED MAY 1, 1908.

1,048,245.

Patented Dec. 24, 1912.

2 SHEETS—SHEET 1.

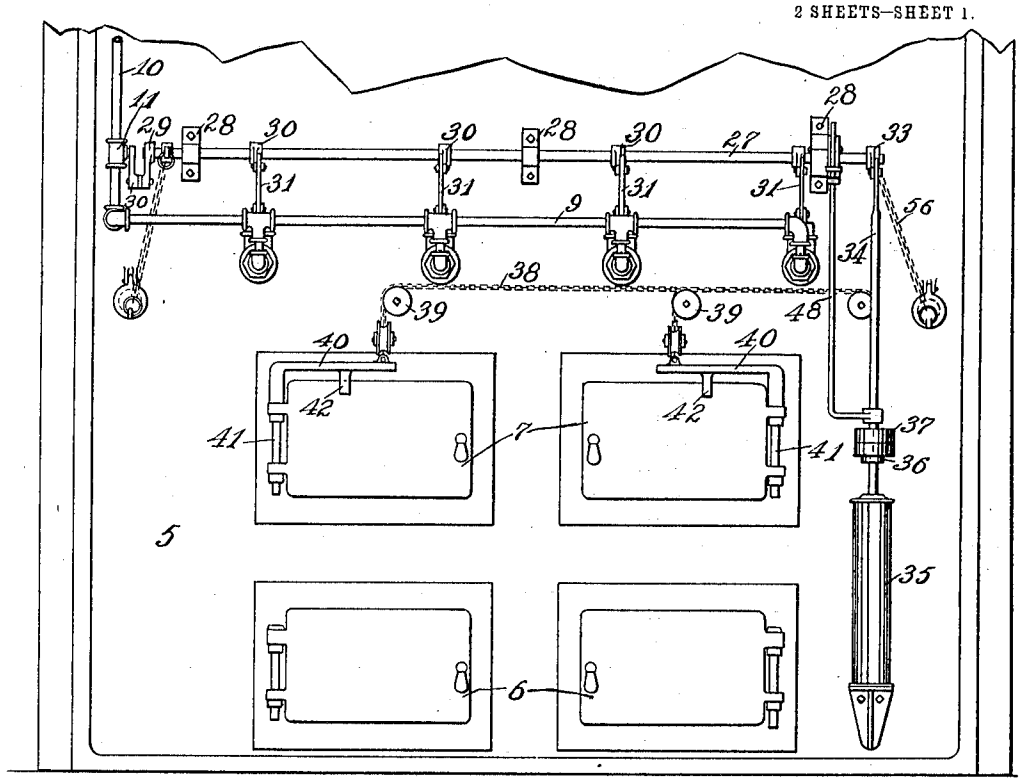

FIG. 1

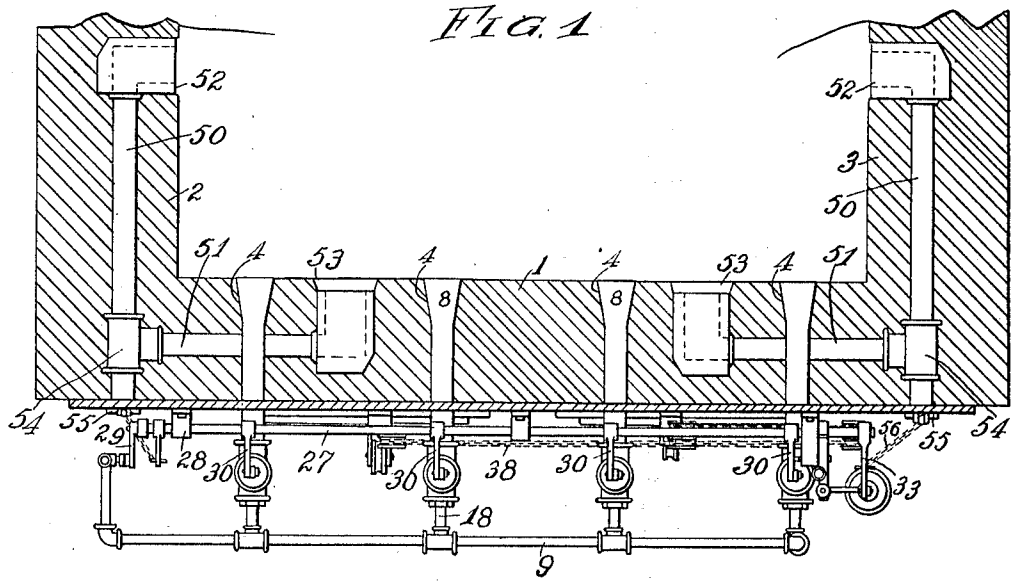

FIG. 2

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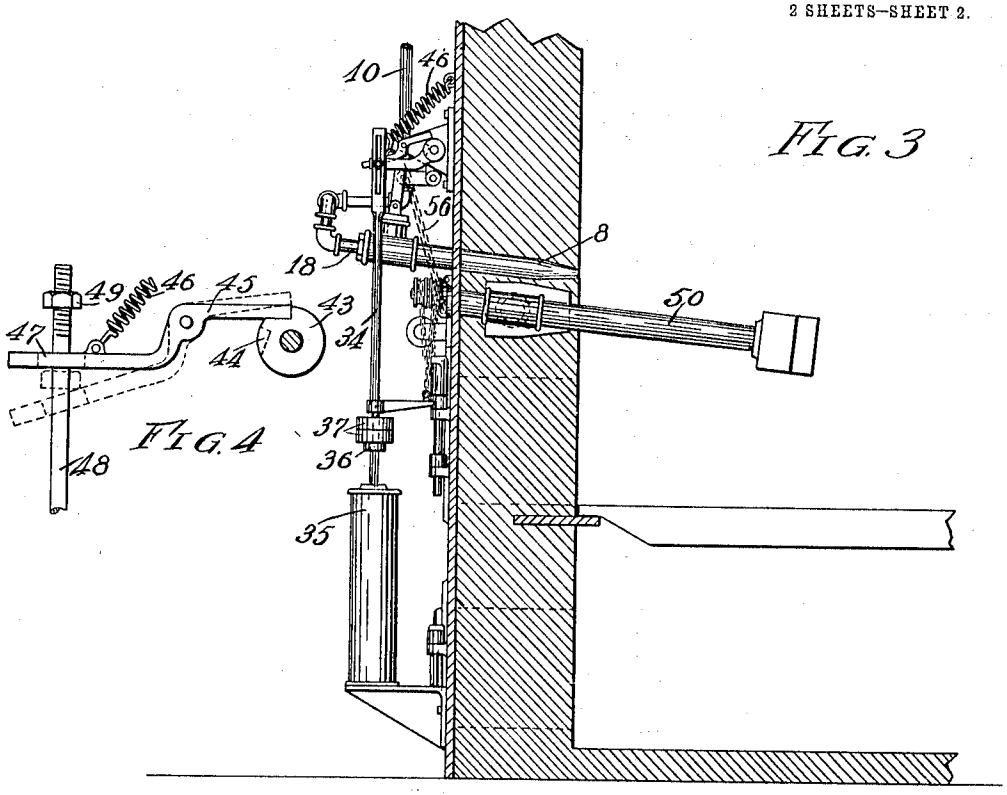

FIG. 3

FIG. 4

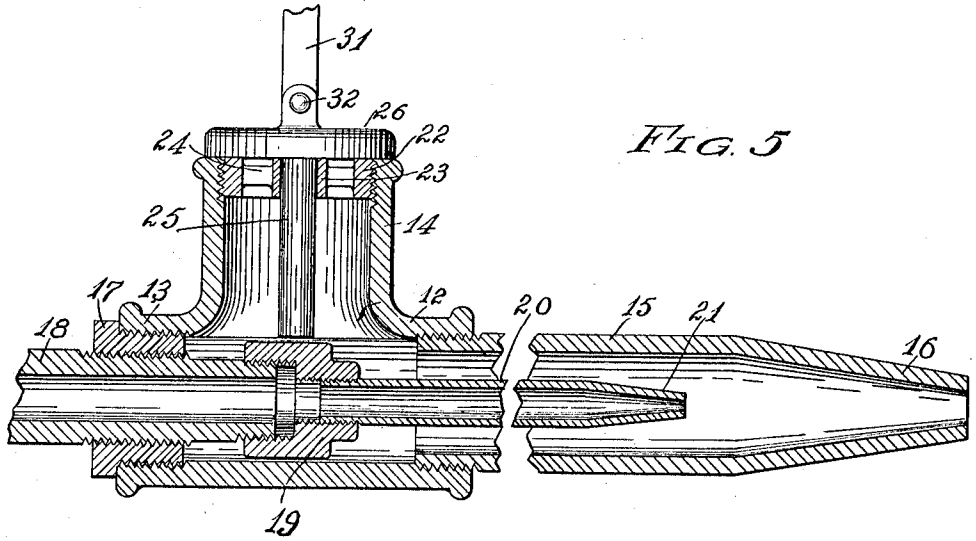

FIG. 5

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UNITED STATES PATENT OFFICE.

OSCAR G. WARNKE, OF CLEVELAND, OHIO.

SMOKE-PREVENTER.

1,048,245. Specification of Letters Patent. Patented Dec. 24, 1912.

Application filed May 1, 1908. Serial No. 430,277.

To all whom it may concern:

Be it known that I, OSCAR G. WARNKE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Smoke-Preventers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates to furnaces and more especially has in view the provision and equipment of a furnace wherein nearly complete combustion of the fuel is obtained, so that the smoke and combustible gases arising from the fuel after a charge of coal has been put in the furnace will be completely burned, thereby preventing the emission of smoke from the stack and securing the maximum heat energy from the fuel.

More specifically, my invention comprises a very efficient device which will automatically feed into the furnace above the fire bed a quantity of steam and air for a predetermined time, whenever the stoking doors are opened, to fire the furnace and moreover to maintain the supply of air and steam unabated during such time and to quickly and completely cut off the supply at the end of the time.

Generally speaking, the invention comprises the elements and combinations thereof herein illustrated and set forth in the accompanying claims.

Reference should be had to the accompanying drawings, which form a part of the specification.

Figure 1 is a front elevation of a portion of the furnace showing my device mounted thereon; Fig. 2 is a sectional plan through the front wall and a portion of the side walls of the furnace; Fig. 3 is a side elevation of the furnace, the side wall being removed; Fig. 4 is an elevation of the detent mechanism used with my device; Fig. 5 is a sectional elevation of the injector nozzle.

The front wall of the furnace is represented at 1 and the side walls at 2 and 3 respectively. The front wall is formed with a series of ports extending therethrough designated at 4, which ports flare at their inner portion in a horizontal direction. On the outer side of the front wall is an iron plate 5, which carries the customary ash doors 6 and stoking doors 7. There are holes through the iron plate 5 which aline with the openings 4 through the front wall of the furnace.

Steam injectors, generally represented at 8, project through the openings 4 in the front wall of the furnace and extend to the end thereof. These injectors extend beyond the plate 5 and at their outer portions are connected with a pipe 9 which runs parallel to and in front of the furnace. This pipe 9 is connected at one end with a vertical pipe 10, which pipe is connected with a source of steam supply. There is a valve 11 in the pipe 10 which opens and closes communication of the steam pipe 10 with the pipe 9, and this valve is operated in a manner hereinafter described. The injectors comprise an outer nozzle having a restricted outlet portion and an inner nozzle or tube also formed with a restricted outlet portion, the inner nozzle being of less length than its surrounding nozzle, and being connected with the steam pipe 9 by means of a connector 18, while the space surrounding this nozzle and inclosed by the outer nozzle is in communication with the atmosphere at such periods of time as steam is admitted through the inner nozzle.

The body of the injector shown in Fig. 5 comprises a T formed with arms 12, 13, and 14, and a nozzle 15 secured within the arm 12 by means of a screw-threaded engagement. This nozzle is restricted at its outer portion as indicated at 16. The arm 13 of the T supports a bushing 17 which is screw-threaded thereto and is provided with a central opening which has screw-threaded engagement with a pipe 18, the said pipe 18 projecting through the bushing 17. The pipe 18 is screw-threaded at its inner portion and has mounted thereon a union or cap 19, which cap is formed with a central opening screw-threaded to engage with a nozzle 20 which is restricted at its outer portion as indicated at 21. The arm 14 of the T has seated at its outer portion a spider 22, the outer part of which is shown as screw-threaded to engage with the screw-threaded walls upon the arm 14. The spider is formed with a central boss 23 which is connected by means of arms 24 with the outer portion of the spider. The central boss 23 has an opening through which projects a rod or post 25, my means of which, the valve cap is always correctly guided to its seat. Mounted upon the post

25 is a cap 26 which is adapted to be seated upon the top portion of the arm 14 so as to close the communication of this arm with the atmosphere. The cap 26 is adapted to be lifted at certain periods in a manner which will be hereinafter described.

A shaft 27 is mounted upon the plate 5 above the doors and is secured to the said plate by means of straps 28, which straps have suitable bearings formed upon them to accommodate the said shaft. At one end the shaft has an arm 29 rigidly secured thereto, which arm has a pivoted connection with another arm 30 that is secured to the valve stem of the valve 11. It will therefore be apparent that when the shaft 27 is rotated the valve stem will be turned in a direction to either open or close the valve 11 according to the direction of rotation of the shaft 27. The shaft 27 also has rigidly secured thereto a series of arms 30 having a pivotal connection with links 31, which latter are hinged to the caps 26 upon the injector nozzles, as indicated at 32. The shaft 27 at the end opposite to the end carrying the lever 29 has rigidly secured thereto an arm 33, which arm has pivotal connection with a vertical rod 34. This rod at its opposite end has connection with a dash pot piston contained within the dash-pot cylinder 35.

The dash-pot is of ordinary construction, permitting the rod 34 to be drawn upward very readily but causing the motion of the rod 34 in a downward direction to be very much slower. The rod 34 at a point slightly above the dash-pot cylinder 35 has a collar 36 secured thereto upon which collar are adapted to be placed weights 37, these weights being varied according to the rapidity with which it is desired to cause the rod 34 to descend. This rod 34 is connected with chains 38, which chains are connected to the stoking doors 7 passing over pulleys 39 which are mounted upon the front plate 5 and are suitably arranged to support the said chains. In proximity to the doors are arms 40, which arms are pivotally supported upon the hinge pintles 41 of the stoking doors. These arms 40 are provided with downwardly projecting lugs 42 which stand in the path of travel of the doors 7 when they are opened.

It will be apparent from the construction which I have described above that as the doors 7 are swung open they will engage with the lugs 42, thereby swinging the arms 40 and causing the chains 38 to pull the rod 34 in an upward direction, which rod, by virtue of its connection with the shaft 27, will cause the shaft to rotate in a direction to elevate the links 31, thereby raising the covers 26 which are upon the injectors and allowing the ready admission of air to the interior of the latter. At the same time, the valve 11 in the pipe 10 will be opened, whereby steam will be admitted to the pipe 9, thence through the pipes 18 and into the inner nozzles 20 of the injectors. The steam will then pass through the restricted portion 16 of the outer nozzle, entraining air as it passes, which air and steam will be carried through the outer nozzle 16 and into the fire-box above the bed of coals.

To cause the continuance of the supply of the steam and air to the fire-box for some appreciable period after the coal has been added, a dash-pot is employed retarding the rotation of the shaft 27 to its normal position for some time after the closing of the doors. The rapidity with which the valves in the injector nozzles and in the steam pipe 10 will be closed is dependent upon the amount of weight 37 employed, which affects the rate of travel of the dash-pot piston within the dash-pot 35.

It is very desirable that the supply of air and steam be maintained unabated in force and quantity for a period sufficient to completely burn the volatile products given from the coal whenever fresh coal is added, if the best results are to be obtained. It has been proposed heretofore to use a dash-pot suitably connected to the air and steam valves so that the said valves will be slowly closed, but in such a construction the pressure of the steam and air becomes comparatively light, as the valves near their closed position, and this is very detrimental, because it will interfere with the regular draft of the furnace. The maximum efficiency is obtained, when, as stated above, the force of air and steam is supplied for the given time unabated, and at the completion of the time is quickly and completely shut off. I have secured this result by the following construction.

Upon the shaft 27 is rigidly secured a collar 43, which collar is formed with a notch 44 in its periphery. A lever 45 is pivotally mounted upon one of the straps 28 and is in such position relative to the collar 23 that one end of the lever may engage in the notch 44 at certain times. This lever 45 is by means of a spring 46, which is secured to the plate 5, always held in a position tending to engage with the notch 44. When the valve in the steam pipe 10 and the valves in the injector nozzles are closed, the position of the collar 43 is such that the notch is below the lever 45 and out of engagement therewith. However, when the shaft 27 is rotated to open the aforesaid valves, the collar 43 will be rotated and the lever 45 will, by virtue of the spring 46, be brought into engagement with the said notch, which engagement will hold the shaft 27 in a position to keep the valve in the steam pipe and the valves in the injector nozzles open. At its outer end, the lever 45 is formed with

a slot 47 through which projects a rod 48. This rod may freely slide through the slot 47, and at its outer end the rod is provided with a nut 49 and at the lower portion the rod is rigidly connected to the rod 34, as shown in Fig. 1.

It will be apparent from the foregoing description that as the rod 34 is raised, the rod 48 will be raised therewith and will freely slide through the slot 47 in the lever 45, thus permitting the lever 45 to engage with the notch 44 in the collar 43 as soon as the shaft 27 is rotated to a position to maintain the valve 11 and valves 26 in open position, in which position the shaft 27 will be held. However, when the rod 31 descends, the rod 48 will likewise descend and at a given time the nut 49 coming in contact with the arm of the lever 45 will release the said lever from its engagement with the notch in the collar 43, so that the shaft 27 will rotate (due to the weight of the parts carried by the rock arms on this shaft) and close the valve in the steam pipe and the valves in the injector nozzles. It will be seen that by regulation of the position of the nut upon the rod 48, the closing of the valves aforesaid may be regulated to take place at any time desired during the descent of the rod 34.

I have provided means for supplying air to the combustion chamber additional to the device which I have heretofore described and by virtue of this auxiliary air supplying means I am enabled to supply air to the combustion chamber at any time it may be desirable. Longitudinal channels are formed in the side and front walls, which channels are formed at right angles to each other and intersect, the channel in the side wall being continued so that it opens through the outer portion of the front wall. These channels communicate with distributing heads or ports 52 and 53 within the side and front walls respectively, which ports are located above the grate and will ordinarily be above the bed of coals upon the grate.

Located in the channels are pipes 50 and 51 which are connected by means of a T as indicated at 54 and at the end of said pipes are elbows 50 and 51 which are enlarged somewhat, which elbows project through the inner portions of the ports 53. The outer end of the pipe 50 is closed by means of a damper plate 55.

The construction just described is duplicated upon the other side wall of the furnace, so that the above description will suffice for and apply to both sides.

When either or both of the chamber plates 55 are raised, air will be admitted through the pipes and due to the draft within the furnace the air will be carried into the combustion chamber. It is thus obvious that I have provided an auxiliary means for admitting the air, whereby a large quantity of air may be admitted at such times as coal is supplied to the furnace or at any other time when it is desired to supply more air to the combustion chamber.

The damper plates 55 are connected to the shaft 27 by means of chains 56 so that as the said shaft is rotated, the plates will be lifted and admit air at the same time that the injectors are operated. Owing to the fact that a flexible connection is used between the plates and the shaft 27, it will be possible to open the plates at any time at which it may be desirable without operating the injectors.

It will be apparent that whenever the stoking doors are opened to fire the furnace the mechanism for feeding the air and steam will be put in operation, thus doing away with the personal equation which is present in so many devices, which requires some attention from the operator to set the air and steam feeding mechanism in operation, or to stop its action. It will also be apparent that by the removal of the arms 40 from their mounting upon the pintles 41 the doors may be opened without operating the air and steam injectors.

I claim:

1. The combination with a furnace having a combustion chamber, of means for supplying air and steam to the combustion chamber, valves for controlling said supply and an oscillating shaft having connections with the valves, means for rotating the shaft in one direction to open the valves, a detent engaging a shaft to hold the shaft in such position and a rod moving in one direction so as to allow the detent to engage the shaft whereby the valves will be held open, said rod moving slowly in the opposite direction to engage the detent to release the shaft whereby the valves are closed.

2. The combination with a furnace having a combustion chamber, of means for supplying air and steam to the combustion chamber, valves for controlling said supply, and an oscillating shaft having connections with the valves, means for rotating the shaft in one direction to open the valves, a detent engaging the shaft to hold the shaft in such position, a dash pot comprising a casing and a piston therein, a rod operated by the piston, the rod moving to allow the detent to engage the shaft when the said shaft is rotated to open the valves and said rod slowly moving in the opposite direction to engage the detent to release the shaft from its engagement therewith whereby the valves will be closed.

3. The combination with a furnace having a combustion chamber, of means for supplying air and steam to the combustion chamber, valves for controlling said supply, and

an oscillating shaft having connections with the valves, means for rotating the shaft in one direction to open the valves, a detent engaging the shaft to hold the shaft in such position, a dash-pot comprising a casing and piston therein, a rod carried by said piston and coupled with the said shaft, a second rod carried by the first rod and movable therewith, means for moving the first mentioned rod to rotate the shaft whereby the valves are opened, the second rod releasing the detent during such operation, means upon the second rod for engaging the detent upon its return movement to release the shaft from its engagement therewith, whereby the valves will be closed.

4. The combination with a furnace having a combustion chamber therein, means for supplying air and steam to the combustion chamber, valves for controlling the supply of the air and steam, an oscillating shaft, connections between said shaft and valves, a dash-pot comprising a piston and a casing, a rod mounted upon said piston and engaging with the said shaft to rock the same, and connections between the said rod and stoking doors, whereby when the doors are opened, the rod will be raised and the shaft rotated, and means for causing the rod to return to its original position, a second rod mounted upon the first rod so as to move therewith, a detent engaging the oscillating shaft to hold the shaft from movement when the valves are opened, means upon the second rod for engaging the detent during its return movement, whereby the oscillating shaft will be disengaged and the valve closed.

5. A furnace formed with a combustion chamber having inclosing walls, channels in the side walls, said channels having an opening upon the exterior of the front wall, other channels in the front wall communicating with the aforesaid channels, ports in the side and front walls with which the said channels communicate, cover plates for closing the channel openings through the front wall, valved connections for supplying a fluid to the combustion chamber, a shaft for operating the valves simultaneously and connections between the shaft and cover plates whereby they will be opened when the shaft is operated.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

OSCAR G. WARNKE.

Witnesses:
A. J. HUDSON,
BRENNAN B. WEST.