J. H. OTTMAN.

SMOKE CONSUMER.

APPLICATION FILED OCT. 14, 1909.

1,059,559.

Patented Apr. 22, 1913.

2 SHEETS—SHEET 1.

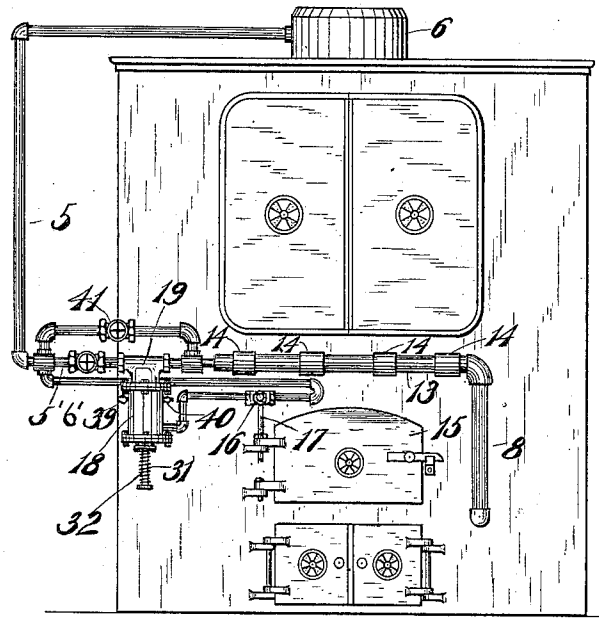

FIG. 1.

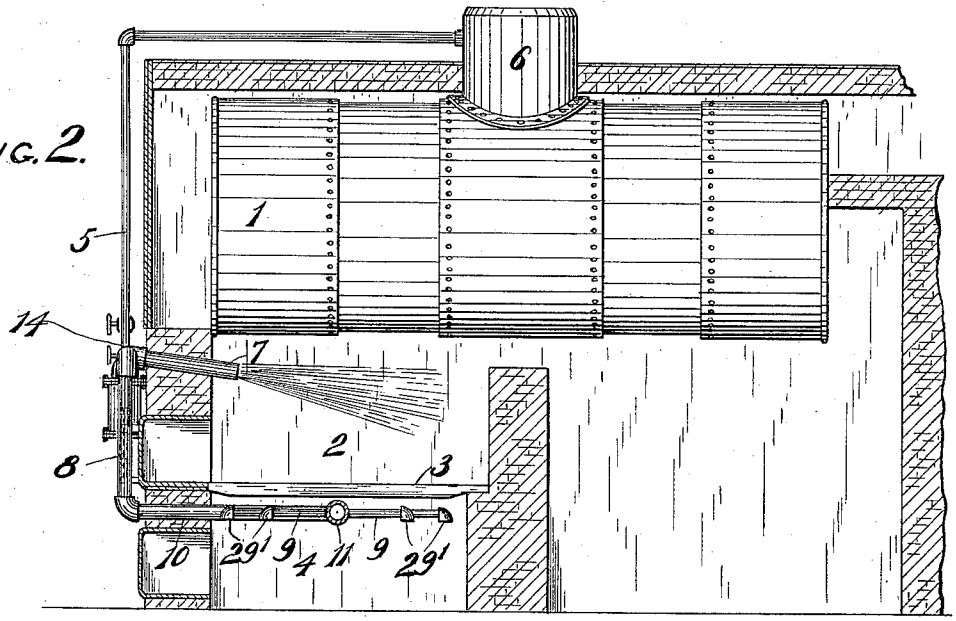

FIG. 2.

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2 SHEETS—SHEET 2.

FIG. 3.

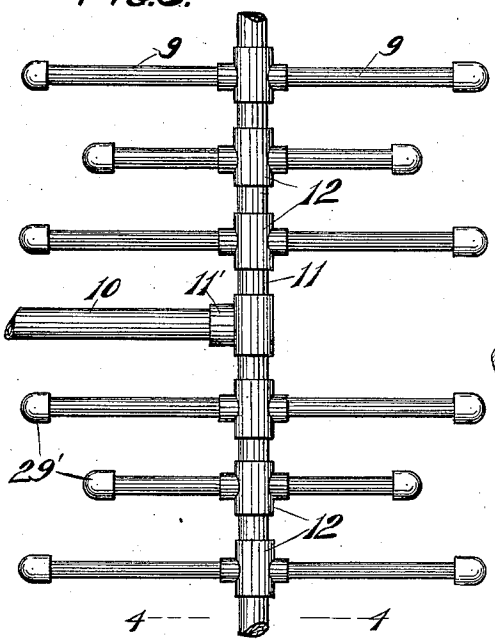


FIG. 7.

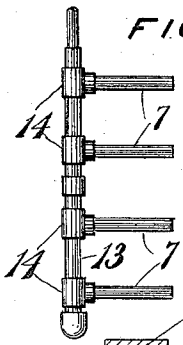


FIG. 6.

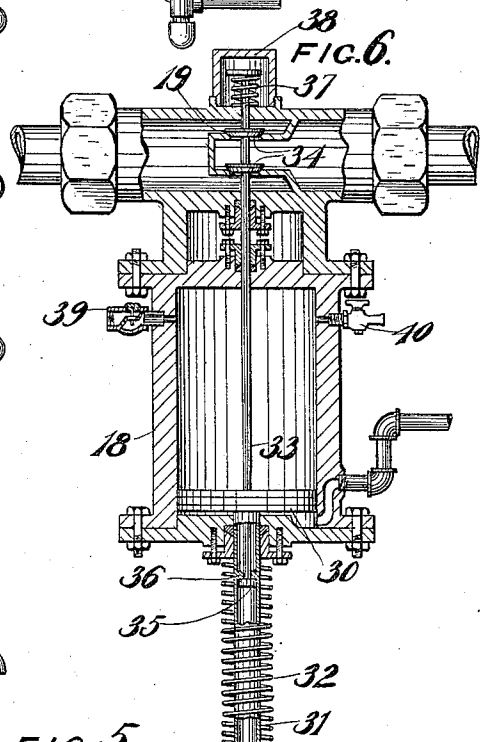


FIG. 4.

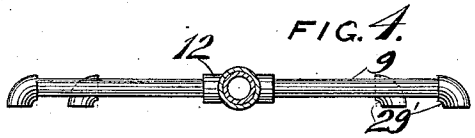


FIG. 5.

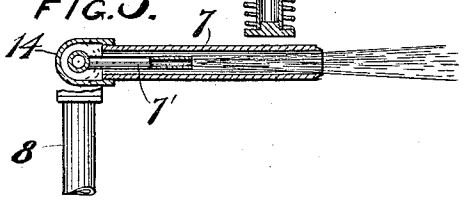
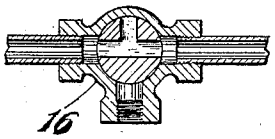


FIG. 8.



WITNESSES.

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UNITED STATES PATENT OFFICE.

JOHN H. OTTMAN, OF MILWAUKEE, WISCONSIN.

SMOKE-CONSUMER.

1,059,559. Specification of Letters Patent. Patented Apr. 22, 1913.

Application filed October 14, 1909. Serial No. 522,565.

To all whom it may concern:

Be it known that I, JOHN H. OTTMAN, residing in Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Smoke-Consumers, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention relates to improvements in that class of smoke consumers which is used in connection with steam boilers or generators, and it pertains more especially among other things to the device by which a down draft from the combustion chamber is produced by which the smoke and unconsumed products of combustion are drawn downwardly through the fuel and pass the grates into the ash pit, when it is conducted from thence by the siphonic action of a steam jet and discharged, together with the steam into the combustion chamber above the fuel whereby a more perfect combustion is produced and the escape of smoke and unconsumed vapor from a furnace is prevented, and whereby the fuel is more perfectly consumed and used with greater economy.

A further object of the invention is to provide a smoke consumer in which the down draft will be created automatically during the period of time the door to the combustion chamber of the furnace remains open and also for a predetermined period of time after the door has been closed.

A further object of the invention is to provide a smoke consumer with means for adjusting the period of time the down draft will be in operation after the door has been closed.

With the above, and other objects in view, the invention consists of the smoke consumer and its parts and combinations, and all equivalents thereof.

The device is further explained by reference to the accompanying drawings, in which,

Figure 1 represents a front view of a boiler provided with the improved smoke consuming system; Fig. 2 is a longitudinal vertical sectional view of the device shown in Fig. 1, the boiler being shown in side elevation; Fig. 3 is a detailed top view of the inlet air pipes located in the ash pit beneath the grate; Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 3; Fig. 5 is a side view, part in section of one of the injector nozzles through which steam and hot air are discharged into the combustion chamber of the furnace; Fig. 6 is a detail view of an automatic device for opening and closing the steam controlling valve through which steam passes from the generator to the combustion chamber of the furnace; Fig. 7 is a plan view of the several injector nozzles shown in Fig. 5; and Fig. 8 is a horizontal sectional view of the door controlled valve.

Like parts are identified by the same reference numerals throughout the several views.

1 is a steam boiler or generator of ordinary construction.

2 is the combustion chamber of the furnace.

3 is a fuel supporting grate.

4 is the ash pit.

5 is a steam duct through which steam is led from the dome 6 of the generator to the nozzles 7 passing through the horizontal duct 5′, valve 6′ and the several branch discharge nozzles 7′ through which nozzle it is discharged into the combustion chamber 2.

8 is a hot air duct which is connected at its lower end with the several branch ducts 9 by the horizontal duct 10, transversely arranged duct 11 and couplings 11′—12, and at its upper end with the several injector nozzles 7, duct 13 and couplings 14, by which arrangement the steam from the generator is discharged through the several steam nozzles 7′ within the several nozzles 7 whereby an injector action is produced in said nozzle 7 which causes a strong current of air to be drawn through the damper opening in the furnace door into the combustion chamber where it is warmed and from the combustion chamber down through the fuel and past the fuel supporting grates into the upper part of the ash pit, when it is drawn from thence through the several branch ducts 9 and the ducts connected therewith up into said nozzle 7 when the hot air and steam are discharged together into the combustion chamber above the grate, whereby the smoke and unburned gases which would otherwise pass off through the smoke-stack are more perfectly consumed and the fuel is used with greater economy. The dampers of the ash pit doors are of course partly closed during this operation, the closing being regulated to just permit sufficient air to enter to support combustion and being less

in amount than is drawn through the duct 8. Air for combustion will also enter through the damper of the furnace door.

Ordinarily in a furnace the chimney produces a certain draft which draws the air and products of combustion toward the flue thereof from below the grate. By means of the jets of steam blowing through the nozzles a suction is created in the air pipes and ash pit below the grate which is greater than the draft of the chimney flue and as the gases of combustion will travel along the line of least resistance, they will pass downwardly through the grate and into the air tubes and are again discharged over the fire bed.

The admission of steam from the boiler to the discharge nozzles 7′ and 7 is manually controlled by the valve 6′. It is a well known fact that the greater proportion of smoke and unconsumed vapors escape from the furnace, as heretofore constructed, immediately after a fresh quantity of coal has been supplied, and that after the combustion of the coal is well under way, the escape of smoke and unconsumed vapors ceases, or is greatly reduced. In view of this fact, I have provided a device by which the supply of steam is automatically turned on by the opening of the furnace door, and whereby such supply is maintained for a predetermined period of time after the door is closed, whereby the smoke consuming system is caused to act the required length of time to produce proper combustion, when the steam valve is automatically closed whereby a useless waste of steam is prevented.

15 is the furnace door.

16 is a steam controlling three-way valve which is connected with the door 15 through the hinge rod 17, which rod is connected with and adapted to be turned by the opening of the door, whereby when the door is opened steam is led through a duct 16′ to the cylinder 18 of a balanced valve 19 connected to the duct 5′. This balanced valve controls the admission of steam to the combustion chamber through the duct 5 and duct 13 and from thence to the nozzle 7, whereby a down draft is produced through the fuel and fuel supporting grates and the smoke and other unconsumed products of combustion are drawn from the ash pit by the injector action of the steam which is discharged into the combustion chamber as previously described until the balanced valve 19 is again closed.

The steam in entering the cylinder 18 of the balanced valve 19 forces up the piston 30 and its tubular stem 31 against the pressure of the coiled spring 32 surrounding said stem and interposed between the cylinder head and the lower flanged end of the stem. A valve stem 33 depending from the valves 34 extends into the tubular stem of the piston and is provided with a head 35 which is engaged by an annular shoulder 36 formed in the tubular piston stem to hold the valves normally in closed position. The piston in moving upwardly will permit the coiled spring 37 positioned in the closure 38 and engaging the upper end of the valve stem to lift said valves and admit steam to the nozzles 7. The air in the cylinder above the piston is permitted to escape through the check valve 39, which opens outwardly and when the piston descends to close the valves, the speed of movement of the piston is controlled by the air cock 40 which admits air to said cylinder above the piston.

After the furnace has been supplied with fuel the door 15 is closed in the ordinary manner and the valve stem of the three-way valve connected thereto will be turned to shut off the supply of steam to the cylinder of the balanced valve and to permit the escape of steam from said cylinder to the open air. As a means for retarding the closing movement of the piston valve, the air cock 40 beforementioned is connected to the upper portion of the cylinder 18, whereby as the piston is moving downwardly by the recoil of the coiled spring 32 it is retarded by the slow admission of air above the cylinder and consequently the steam is admitted to the nozzles for a period of time after the door has been closed.

The air controlling valve 40 through which the air is permitted to enter the cylinder 18 as the piston is moved by the recoil of said spring is regulated to control the speed of movement of the piston by turning the handle thereof.

It will be understood from the foregoing that the steam valve 19 will remain in its open position a greater or less length of time according to the adjustment of the air valve 40, and that steam will be thereby admitted to the combustion chamber any predetermined length of time as circumstances may require.

When desirable to control the admission of steam to the combustion chamber manually, the valve 41 is opened, and when it is desirable to automatically control the admission of steam, the valve 41 is closed.

To prevent ashes and other similar products of combustion from entering the ducts 9, they are preferably provided with downward opening L shaped bends 29′.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a device of the class described, the combination of a steam generator, a combustion chamber, a grate therein, an ash pit beneath said grate, a nozzle having its discharge end in said combustion chamber above the grate, a steam duct leading from

the steam space in said generator to said nozzle, a duct for establishing communication from the ash pit beneath the grate to said nozzle above the grate, a plurality of branch ducts so arranged as to effect a substantially uniform down draft throughout the area of the fuel bed, and connected with said last named duct, and means for controlling the admission of steam through said steam duct to said nozzle.

2. In a device for producing a down draft from the combustion chamber of a steam generator through the fuel and fuel supporting grate to the ash pit, the combination of a steam generator, a combustion chamber, one or more nozzles having their discharge ends in said combustion chamber, a steam duct leading from the steam generator to said nozzle or nozzles, an ash pit, a fuel supporting grate, a duct for establishing communication between said ash pit beneath the grate, and said nozzle or nozzles above the grate, branch air and gas ducts located in close proximity to the lower side of the grate in open communication with said last named duct, said branch ducts being so arranged as to effect a substantially uniform down draft throughout the area of the fuel bed, and means for controlling the admission of steam to said nozzle or nozzles for a predetermined period of time after the furnace door is closed, whereby a down draft is produced through the grate and the distilled gases of fresh fuel are consumed.

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

JOHN H. OTTMAN.

Witnesses:
C. H. KEENEY,
ANNA F. SCHMIDTBAUER.