May 9, 1933. E. C. KLINE 1,908,025

HEATING APPARATUS

Filed March 3, 1930 2 Sheets-Sheet 1

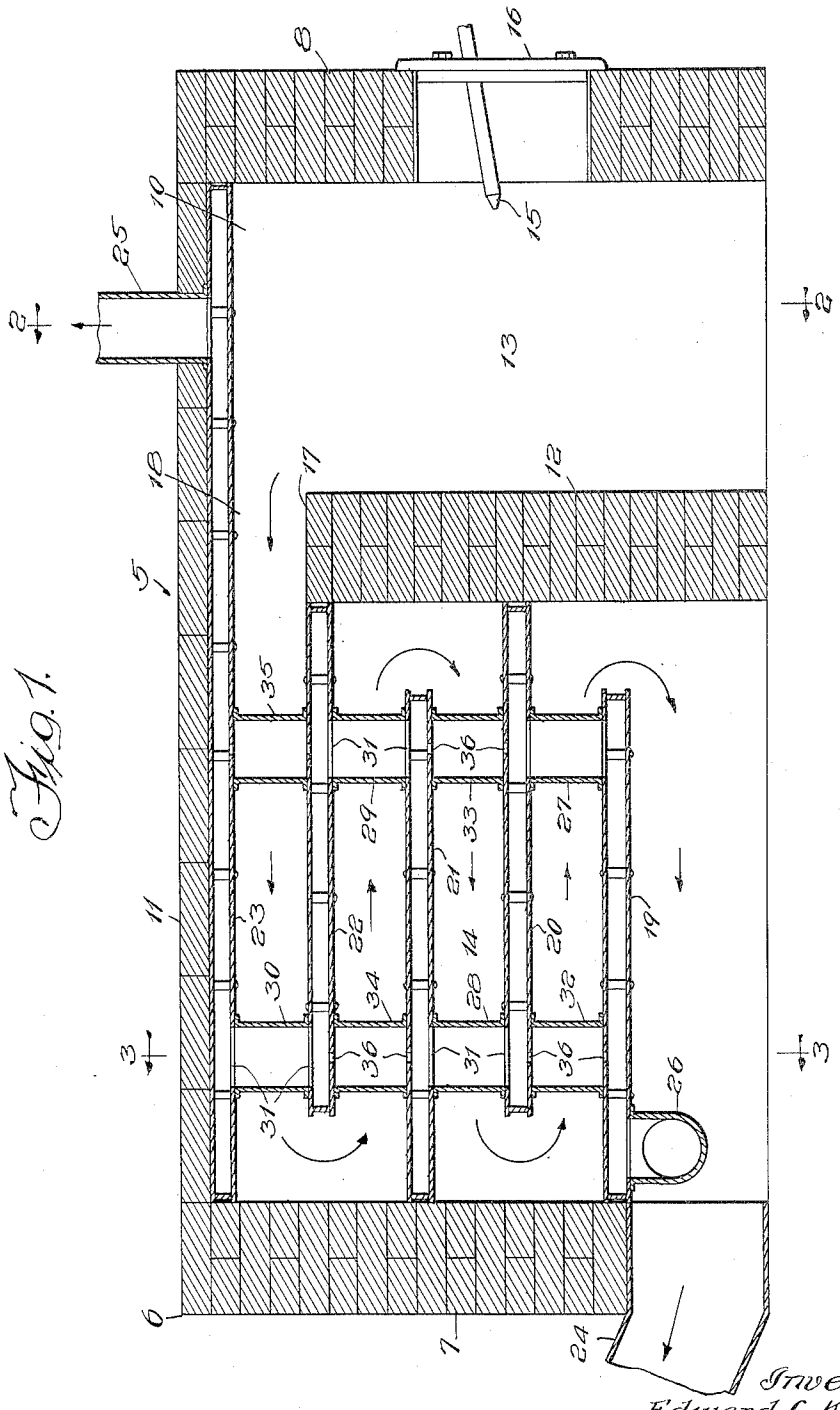

Fig. 1.

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Fig. 2.

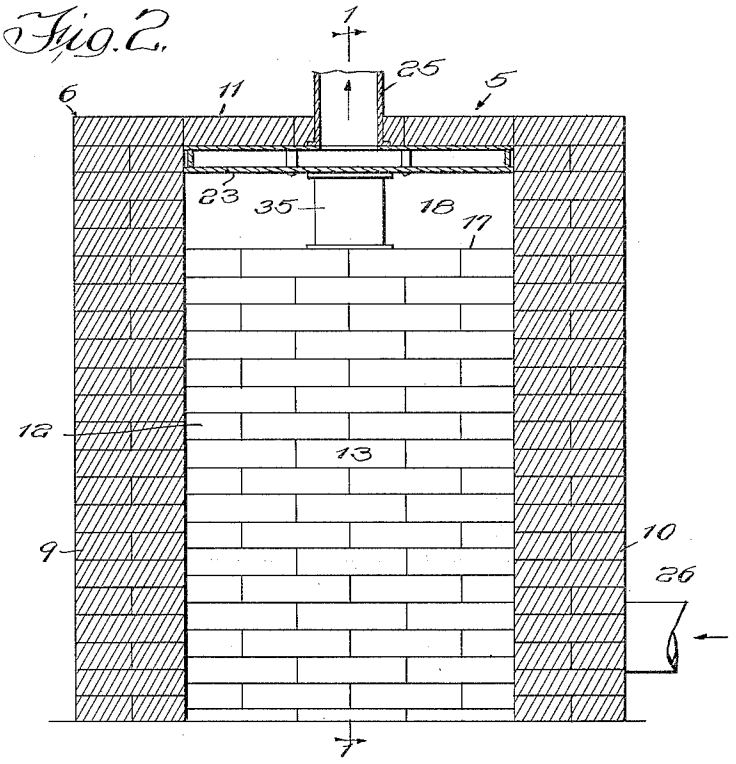
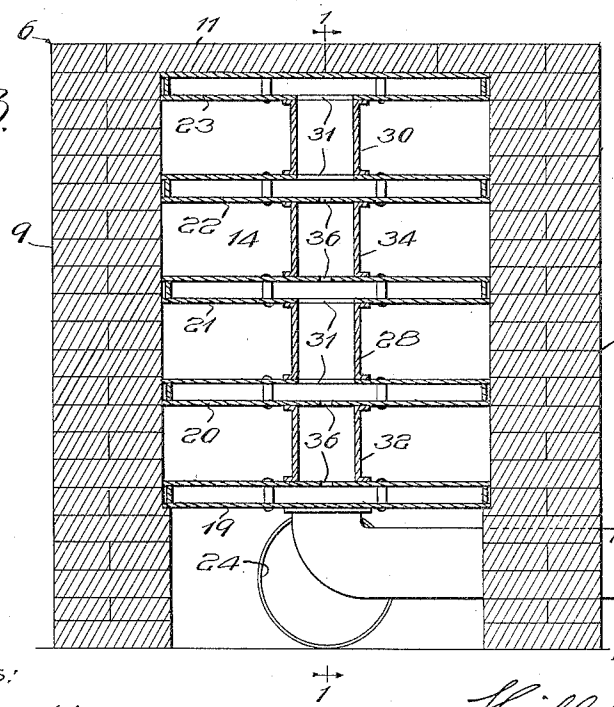


Fig. 3.



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UNITED STATES PATENT OFFICE

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HEATING APPARATUS

Application filed March 3, 1930. Serial No. 432,736.

This invention relates to heating apparatus or devices, and particularly to apparatus of the type designed for imparting heat to a fluid such, for example, as water, while the fluid is being circulated through the device, after which the fluid or steam obtained from the heated fluid may be employed for heating purposes, as desired.

More specifically, the present invention relates to heating apparatus having a down draft, and, among other objects is intended to provide a construction and arrangement whereby suitable draft may be obtained to insure proper combustion of the fuel employed in operating the device, and to insure efficient circulation of the products of combustion in a manner to obtain the maximum of efficiency in the transfer of heat units to the fluid circulating through the apparatus.

Frequently, considerable damage has been done by conflagrations resulting from overheated stacks or chimneys due to excessive firing in extremely cold weather, and it is, therefore, an object of the present invention to provide a device so constructed and arranged as to remove a very large proportion of the heat units from the gases of combustion before they enter the stack, thereby insuring a relatively cool stack and utilizing the heat units to obtain the maximum heating efficiency of the apparatus.

Another object of the invention is to provide suitable means for retaining the heat of combustion within the apparatus to insure a proper draft when periodically starting a burner, such as an oil burner, or the like, which may be automatically controlled.

Another object of the invention is to provide a heat retaining wall or partition of substantial proportions which is capable of furnishing hot dry air to the smoke flues over an appreciable period of time, thereby counteracting the chilling or cooling and dampening effect of the water on the flue spaces of the apparatus, and providing hot dry air to insure perfect draft for combustion and the circulation of the gases of combustion through the flues of the device.

Another object of the invention is to accelerate circulation of the fluid, such as water through the device, and to apply a high degree of heat to the fluid just prior to its leaving the apparatus.

A further object of the invention is to provide a device of the character described wherein the fluid employed is circulated through the device in the opposite direction to that in which the products of combustion are circulated.

A still further object of the invention is to improve devices of the character described in sundry details hereinafter referred to and particularly pointed out in the appended claims.

One embodiment of the present invention is shown for illustrative purposes in the accompanying drawings in which

Fig. 1 is a longitudinal sectional elevational view through a heating apparatus illustrating an embodiment of the present invention and taken substantially as indicated by the lines 1—1 in Figs. 2 and 3;

Fig. 2 is a transverse sectional view taken substantially as indicated by the line 2—2 of Fig. 1; and

Fig. 3 is a sectional elevational view taken substantially as indicated by the line 3—3 of Fig. 1.

In the illustrative embodiment of the invention shown in the drawings, the apparatus, designated as a whole by the numeral 5 comprises a setting 6 of brick or other suitable material having end walls 7 and 8, side walls 9 and 10 and a top portion 11.

Suitably positioned within the interior of the setting preferably intermediate the end walls 7 and 8, and extending transversely of the setting between the side walls 9 and 10 is a heat absorbing partition wall 12 of substantial heavy construction and formed preferably of fire brick or other suitable slow-cooling material capable of holding and slowly emitting heat over a comparatively long period of time. The partition wall, it will be noted, divides the interior of the setting into a plurality of compartments as, for example, a combustion chamber 13 on one side of the wall, and a heating chamber 14 on the other, the combustion chamber 13 being adapted to receive any suitable or desired

fuel as, for example, oil, or the like, and in the present instance, the illustrative embodiment is shown as provided with a nozzle 15 extending through a door 16, or the like, suitably mounted in the wall 8 of the setting by which a liquid fuel may be injected into the combustion chamber.

It will be noted that the upper end 17 of the partition wall 12 terminates a substantial distance below the top portion of the setting. thereby providing a passage 18 by which communication is established between the combustion chamber 13 and heating chamber 14 adjacent the upper portions of said chambers.

Suitably mounted in the heating chamber 14 are a plurality of series of hollow water baffles 19, 20, 21, 22 and 23 spaced apart from each other and positioned in the heating chamber of the setting in staggered relationship with respect to each other, the ends of alternate baffles being positioned adjacent one of the end walls of the setting and the partition wall 12, certain of said baffles terminating short of the partition wall 12, and other of said baffles terminating short of said end wall in a manner to form a circuitous passage or flue space through the heating chamber for conducting the gases of combustion from the combustion chamber 13 to a stack or chimney connection 24 shown, in the present instance, as positioned in the end wall 7 and communicating with the lower or discharge end of the circuitous passage or flue space formed by the water baffles in the heating chamber 14.

In the present construction illustrated in the drawings, the rear end portions of the baffles 19, 21 and 23 are positioned adjacent the rear wall 7 of the setting and the opposite or front end of the baffles 19 and 21 terminate a substantial distance short of the partition wall 12, while the forward end of the baffles 20 and 22 are positioned adjacent the partition wall 12 and the opposite or rear ends of the baffles 20 and 22 terminate a substantial distance short of the wall 7, thereby causing the gases of combustion in their passage from the combustion chamber 13 to the stack connection 24, to follow a course along the upper and lower sides of the baffles 19, 20, 21 and 22 and along the lower side of the baffle 23 in the direction and as indicated by the arrows in Fig. 1.

It will be noted that the baffle 23 is of somewhat greater length than the baffles 19, 20, 21 and 22, and extends through the communicating passage 18 into the combustion chamber 13, preferably adjacent the upper end thereof, and is provided with an outlet pipe 25 by which the heating fluid is conducted to coils or other suitable heat radiating devices (not shown) as may be desired.

Suitably connected to one end of the lowermost baffle 19, preferably adjacent the stack connection 24 at the discharge end of the circuitous passage formed in the heating chamber, is an inlet or return pipe 26 by which the fluid, after passing through the heat radiating devices is returned to the apparatus and again circulated through the baffles in a manner to absorb the heat from the gases of combustion passing through the heating chamber.

For establishing free and unrestricted communication between adjacent baffles, a plurality of fluid conducting nipples 27, 28, 29 and 30 are provided, the said nipples being adapted to register with apertures 31 formed in the upper and lower walls of adjacent baffles and having an area substantially equal to the cross sectional area of the nipples. These nipples not only serve to conduct the fluid from one baffle to another, but serve also to space the adjacent end portions of the baffles with respect to each other.

For spacing the baffles at their opposite end portions from the nipples 27, 28, 29 and 30, a plurality of fluid conducting spacers or nipples 32, 33, 34 and 35 are provided, having means associated therewith in the form of relatively small apertures 36 formed in adjacent baffles and adapted to register with the opening in the nipples 32, 33, 34 and 35 in a manner to permit a restricted flow of fluid through the fluid conducting spacers or nipples.

In the circulation of the fluid through the apparatus, a relatively small portion of the fluid will pass through the spacing nipples 32, 33, 34 and 35 by reason of the relatively small apertures 36 communicating therewith, thereby avoiding the excessive heating and burning out of the spacers, and assisting, by reason of the excessive heat absorbed in the relatively slow passage of the fluid through the spacing nipples, in accelerating the flow of fluid through the device.

It will be observed from the foregoing description that in the present arrangement, the products of combustion are discharged from the combustion chamber 13 adjacent the upper portion thereof through the communicating passage 18 and pass in a downward direction through a circuitous passage formed in the heating chamber 14, and are conducted to the stack connection 24 adjacent the lower portion of the heating chamber, while the fluid in its passage from the intake pipe 26 follows a circuitous course upwardly through the baffles and connecting nipples to the discharge or outlet pipe 25 adjacent the upper end of the combustion chamber 13. Thus, it will be observed that a maximum of heat units are transferred to the fluid from the gases of combustion in their passage through the heating chamber and the gases are thereby more or less cooled, and that by reason of the return pipe 26, carrying relatively cooler fluid, being positioned

adjacent the stack connection 24, the gases of combustion are further cooled before entering the chimney or stack, thereby insuring a relatively cool stack and eliminating the possibility of fire from an overheated stack due to excessive firing of the apparatus.

It will be observed also that the flow of fluid through the hollow baffles is materially accelerated, not only by the high degree of heat absorbed by the slow passage of fluid through the spacing nipples, but also by reason of applying a high degree of heat from the gases of combustion to the fluid adjacent the upper portion of the combustion chamber 13 and just before the fluid leaves the apparatus for passage to the coils or other heat radiating devices, the application of the high degree of heat at this point producing rapid acceleration of the fluid and providing the fluid with a maximum degree of heat units to be radiated by the coils or other heat radiating devices.

In the illustrative embodiment, the partition wall 12 being of thick, heavy construction and being formed of suitable heat absorbing material serves to keep the air in the flue spaces of the heating chamber warm and dry when the fire in the combustion chamber is periodically extinguished or low as in the use of liquid fuel, thereby maintaining a condition in the heating chamber and flue spaces whereby suitable draft therein is assured whenever the fuel is again ignited in the combustion chamber.

It will be observed from the foregoing description that the present invention provides a heating apparatus of high thermal efficiency, capable of transferring a large number of heat units to a large quantity of fluid passing therethrough, and in which the flow of fluid through the device is materially accelerated; furthermore, that suitable draft through the apparatus is provided by the retention of heat within the setting, and maintaining the air in the heating chamber and flue spaces in a dry condition.

It will also be observed that the present invention provides a device wherein a very large proportion of the heat units are removed from the gases of combustion before they enter the stack or chimney, thereby insuring a relatively cool stack, reducing the fire hazard to a minimum, and eliminating possible damage by reason of overheating.

Obviously, the present invention is not limited to the precise construction and arrangement shown and described as the same may be variously modified. Moreover, all the features of the invention need not be used conjointly as the same may be used to advantage in variously different combinations and sub-combinations.

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

1. In a heating apparatus, the combination of a setting, a solid heat absorbing partition wall positioned therein in a manner to form a combustion chamber and a heating chamber in said setting and terminating below the upper portion thereof in a manner to provide a communicating passage between said chambers adjacent their upper end portions, a plurality of hollow fluid conducting baffles positioned in said heating chamber and forming a circuitous passage therein communicating with the passage between said chambers, and a stack connection communicating with said circuitous passage at a point remote from said communicating passage.

2. In a heating apparatus, the combination of a setting, a solid thick heat absorbing slow cooling partition wall positioned therein in a manner to form a combustion chamber and a heating chamber in said setting and terminating below the upper portion thereof in a manner to provide a communicating passage between said chambers adjacent their upper end portions, a plurality of hollow fluid conducting baffles positioned in said heating chamber and forming a circuitous passage therein communicating at one end with the passage between said chambers, and a stack connection positioned adjacent the lower portion of said setting and communicating with the opposite end of said circuitous passage.

3. In a heating apparatus, the combination of a setting, a stack connection adjacent the lower portion thereof, a solid heat absorbing partition wall positioned in said setting in a manner to form a combustion chamber and a heating chamber therein and terminating below the upper portion of the setting in a manner to provide a communicating passage between said chambers adjacent their upper end portions, a plurality of hollow fluid conducting baffles positioned in said heating chamber in staggered overlapping relationship with respect to each other in a manner to form a circuitous passage communicating at one of its end portions with the passage between said chambers and at its opposite end portion with said stack connection for conducting the gases of combustion in a downward direction through the heating chamber, a fluid inlet pipe communicating with the lowermost baffle in said heating chamber, and an outlet pipe communicating with the uppermost baffle.

4. In a heating apparatus, the combination of a setting, a stack connection adjacent the lower portion thereof, a solid heat retaining partition wall positioned in said setting in a manner to form a combustion chamber and a heating chamber therein and terminating below the upper portion of the setting in a manner to provide a communicating passage between said chambers adjacent their upper

end portions, a plurality of hollow fluid conducting baffles positioned in said heating chamber in staggered overlapping relationship with respect to each other in a manner to form a circuitous passage communicating at its upper end portion with the passage between said chambers and at its lower end portion with said stack connection for conducting the gases of combustion in a substantially horizontal and downward direction through the heating chamber, a fluid inlet pipe communicating with the lowermost hollow baffle in said heating chamber adjacent the lower end of said circuitous passage, and an outlet pipe communicating with the uppermost baffle above the upper portion of said combustion chamber.

5. In a heating apparatus, the combination of a setting, a stack connection adjacent the lower portion thereof, a heat retaining partition wall positioned in said setting in a manner to form a combustion chamber and a heating chamber therein and terminating below the upper portion of the setting in a manner to provide a communicating passage between said chambers adjacent their upper end portions, a series of hollow communicating fluid conducting baffles positioned in said heating chamber in staggered overlapping relationship with respect to each other in a manner to form a circuitous passage communicating at its upper end portion with the passage between said chambers and at its lower end portion with said stack connection for conducting the gases of combustion in a downward direction through the heating chamber, the uppermost baffle of said series extending into said combustion chamber, a fluid inlet pipe communicating with the lowermost hollow baffle in said heating chamber adjacent said stack connection, and an outlet pipe communicating with the portion of the uppermost baffle positioned in said combustion chamber.

6. In a heating apparatus, the combination of a setting, a stack connection adjacent the lower portion thereof, a heat retaining partition wall positioned in said setting in a manner to form a combustion chamber and a heating chamber therein and terminating below the upper portion of the setting in a manner to provide a communicating passage between said chambers adjacent their upper end portions, a plurality of hollow communicating fluid conducting baffles positioned in said heating chamber in staggered overlapping relationship with respect to each other in a manner to form a circuitous passage communicating at its upper end portion with the passage between said chambers and at its lower end portion with said stack connection for conducting the gases of combustion in a downward direction through the heating chamber, the uppermost baffle extending through said communicating passage into said combustion chamber at the top thereof, a fluid inlet pipe communicating with the lowermost hollow baffle in said heating chamber adjacent said stack connection, and an outlet pipe communicating with the portion of the uppermost baffle positioned in said combustion chamber.

In witness whereof, I hereunto subscribe my name this 19th day of February A. D., 1930.

EDWARD C. KLINE.