

May 23, 1933.

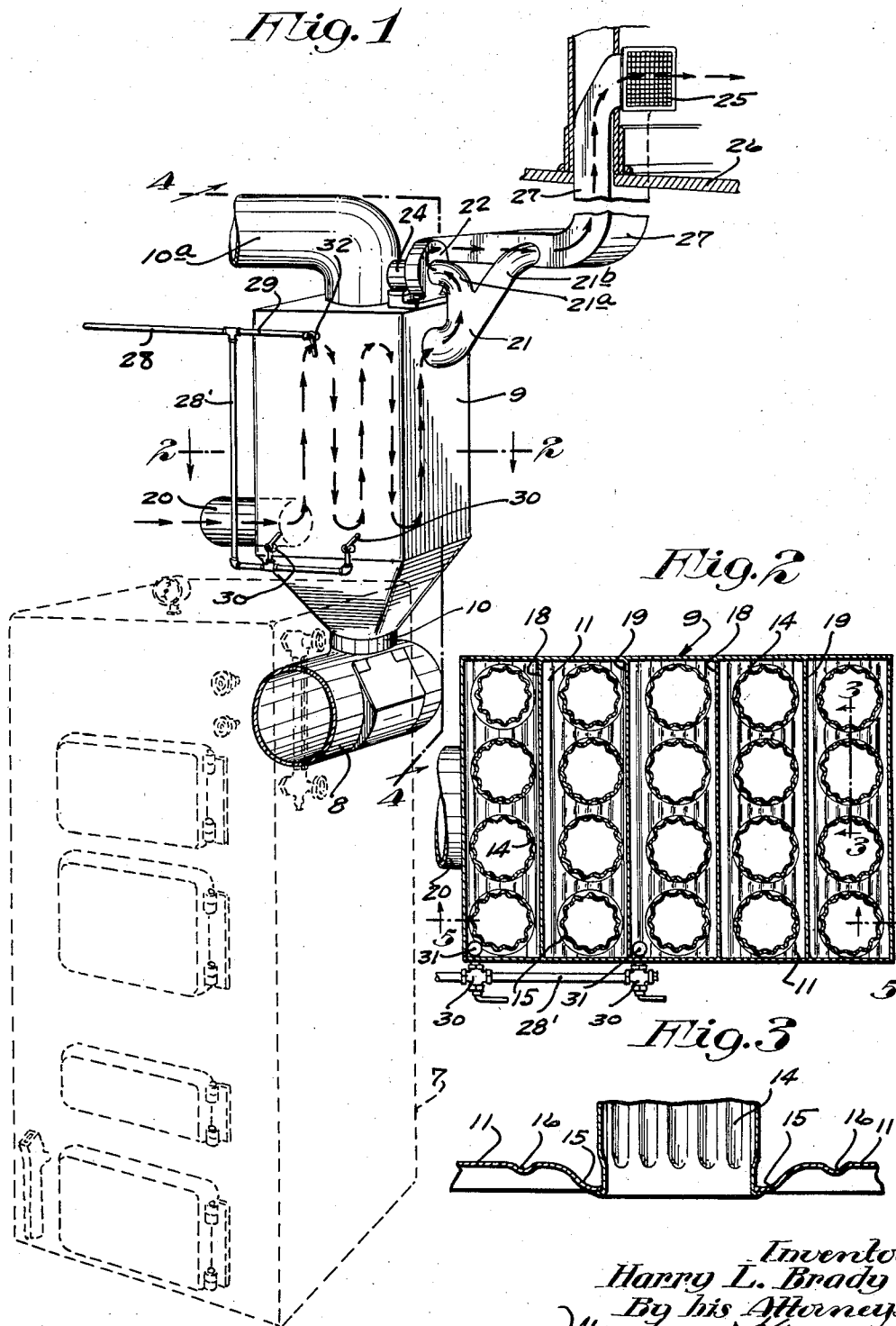
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HEAT SAVER AND HUMIDIFIER

Filed March 17, 1932

2 Sheets-Sheet 1



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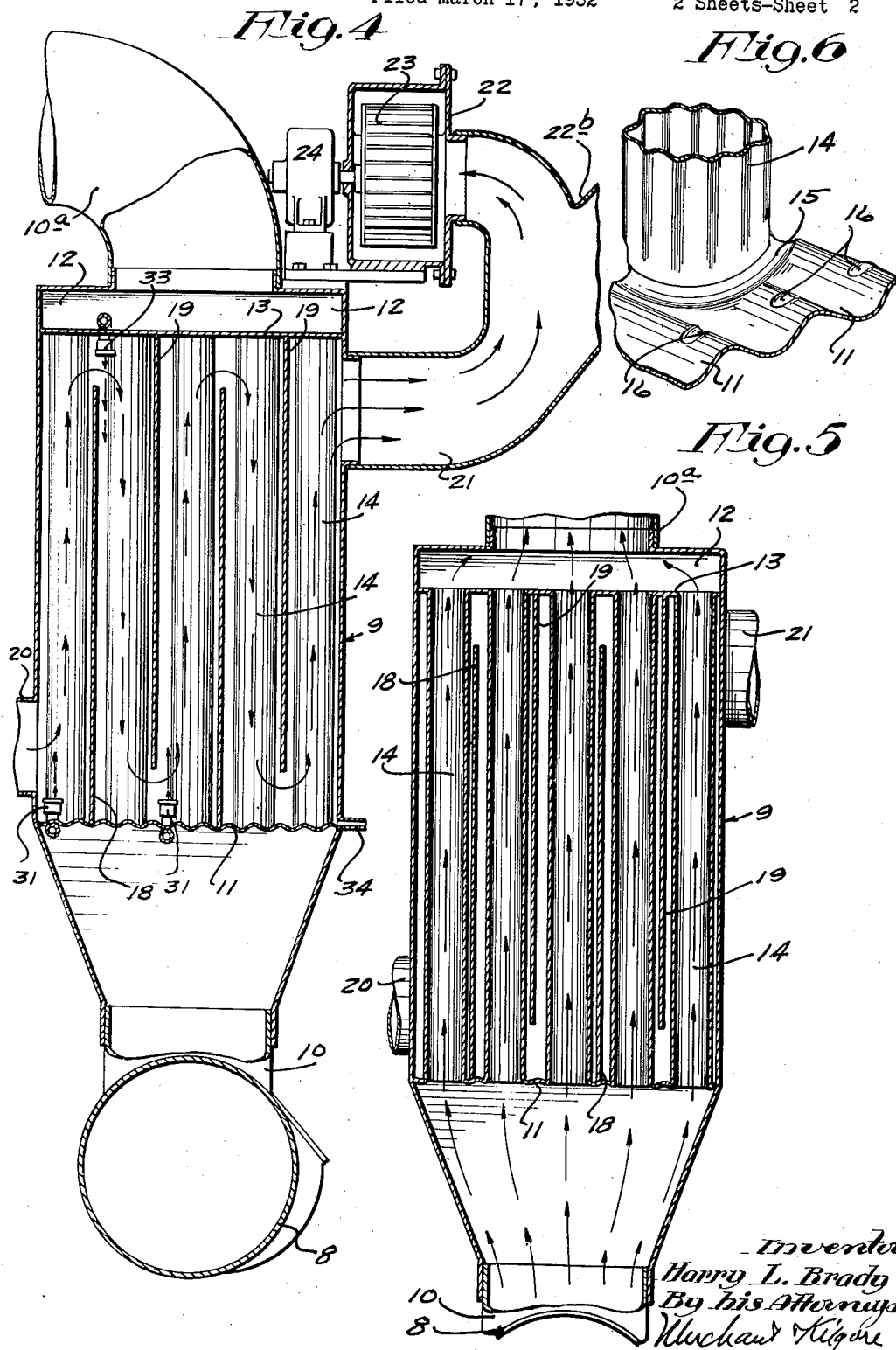
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UNITED STATES PATENT OFFICE

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HEAT SAVER AND HUMIDIFIER

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My invention provides a simple and highly efficient auxiliary device or attachment for furnaces and, generally stated, consists of the novel devices, combinations of devices, and arrangement of parts hereinafter described and defined in the claims.

The device, as preferably designed, is arranged to be used both during the winter or cold part of the year and during the summer or hot part of the year. In its first noted use, it will operate as a heat saver and humidifier and in its second noted use, it will operate as an air cooler. The device is especially designed for quick and easy connection to the smoke pipe of a furnace so that it will absorb heat from the gases passing to the chimney and the heat of which under ordinary conditions is wasted. By a novel arrangement of the interior of the casing of the device, the hot gases are utilized to cause evaporation of water substantially in proportion to the heat passing through the device, whereby the air of a room or house heated by the furnace, will be given the desired humidity.

A commercial form of the improved device is illustrated in the accompanying drawings wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a perspective with some parts being shown by dotted lines, some parts in section and some parts being broken away, illustrating the construction and manner of installation of the improved device;

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary section taken approximately on the line 3—3 of Fig. 2;

Fig. 4 is a vertical section taken approximately in the plane of the line marked 4—4 on Fig. 1;

Fig. 5 is a transverse vertical section taken on the line 5—5 of Fig. 2; and

Fig. 6 is a fragmentary perspective showing a portion of the evaporating plate and one of the flues.

In Fig. 1, a furnace which may be of any commercial well-known or other structure is

indicated by dotted lines and is designated as an entirety by the numeral 7. In Figs. 1 and 4, the numeral 8 indicates an ordinary damper-equipped smoke hood that leads from the back of the furnace and from which the smoke pipe ordinarily leads directly to the chimney. In accordance with my invention, my improved auxiliary device is interposed in the smoke pipe or connection between the furnace and chimney. As shown, the auxiliary device is formed with a box-like sheet metal casing 9 that is interposed or directly connected between lower and upper sections 10 and 10^a of the smoke pipe. The section 10 of course leads directly from the smoke hood 8. The lower portion of the casing 9 is preferably hopper-shaped or upwardly flaring so that the horizontal cross-section of the casing 9 is very greatly enlarged horizontally beyond the dimensions of the smoke pipe. Secured to the walls of and extended across the lower portion of the body of the casing 9 at its junction with the bottom thereof, is a lower flue sheet 11 that is utilized as a water evaporation plate. This sheet or plate 11 is indented or otherwise irregularly formed so that it is provided with a multiplicity of shallow water-receiving pockets.

Secured to the walls of and extending completely across the upper portion of the casing 9 but spaced therefrom to form an upper air header 12 is an upper flue sheet 13. Sheet metal flues 14 are connected to and open through the flue sheets 11 and 13. Preferably, these flue sheets are longitudinally corrugated to increase their heat-radiating surfaces. At the junction of the flues 14 with the lower sheet 11, said sheet is formed with annular depressions as indicated at 15, and best shown in Figs. 3 and 6, by reference to which views it will be further noted that the corrugations of the sheet 11 in their crowns, are formed with depressed valleys 16 that permit water to flow between the valleys of the corrugations and into the annular depressions 15. The flues 14, it will be noted, are arranged in rows that are spaced to afford free air passages between the same. To cause the air

passing through the casing to move alternately upward and downward, the lower flue sheet 11 is provided with upwardly extended baffle plates 18 and the upper flue sheet 13 is provided with depending baffle plates 19. The baffles 18 and 19 are located alternately between the adjacent rows of flues and terminate short of the flue sheets to which they are not attached, so that the air passing through the casing will be caused to move first upward, then downward, etc., until with the particular arrangement illustrated, the air has been caused to travel about five times as far as it would have to travel if the baffle plates were not interposed in its natural line of travel.

The casing 9 is provided with an air intake passage, shown as formed by a short air tube 20 located near the bottom of one side thereof, and extending from the upper portion of the opposite side of said casing, is an air outlet afforded by a tube 21, which, for the particular purpose here illustrated, has two branches 21^a and 21^b.

In Figs. 1 and 4, the numeral 22 indicates a fan casing within which, as shown, is a fan head 23 driven by a small electric motor 24, all of the said parts 22 to 24 being, as shown, suitably mounted on the top of the casing 9. The air branch tube 21^a leads to the intake of the fan casing 22.

In Fig. 1, the numeral 25 indicates a hot air register located in one of the rooms 26 and having an air supply pipe 27 that is connected to the air discharge passage of the fan casing 22 and to the air branch tube 21^b.

Water from a suitable source of supply such as a city water pipe is supplied to the device through a pipe 28 that has branches 28' and 29. Branch pipe 28' leads through valves 30, to nozzles 31 located just inside the casing close to the lower or evaporating plate 11. Branch pipe 29 leads through a valve 32 to an upper nozzle 33 located just below the upper plate 13. The numeral 34 indicates a small drain pipe that leads from the casing 9 at a point just high enough above the plate 11 to prevent the said plate from being completely drained of water.

In the main use of the device, to wit: the use thereof during cold weather, when the furnace is in action, to save heat and supply the room or house with humidified air, the valve 32 may be closed and one of the valves 30 can be closed or both thereof can be opened to a limited extent sufficient to permit the corrugated or pocketed evaporating plate 11 to be more or less covered with water and the pockets or depressions thereof including the annular depressions 15 around the bases of the flues 14 to contain water.

The hot products of combustion from the

furnace delivered into the lower compartment of the casing 9 below the plate 11 will directly strike said plate, making the same hot enough to cause rapid evaporation of the water on the plate. If there be a surplus of water, it will run off through the drain pipe 34. The air will be drawn into the casing 9 through the pipe 20 and will be brought into a long and closely associated contact with the several flues 14, which latter, of course, will be kept hot by the upwardly moving products of combustion passed therethrough. The air, in passing through the casing with the number of baffle plates 18 and 19 shown, will be caused to move first upward, then downward, then upward, then downward, and then upward, making a travel of five times the distance between the plates 11 and 13 while the air is moving through the casing into the outlet pipe 21. This gives sufficient travel to the air to permit the same to absorb a large amount of heat and to pick up the water vapors from the outgoing products of combustion, which, as noted, move through the tubes 14 to the stack section 10^a.

In the use of this device as a heat saver and humidifier, it is not necessary that the fan 23 be in action, because under natural draft, the warmed and humidified air will be caused to pass through the branch pipe 21^b and pipe 27 to the register 25 and thence into the room. Of course, any desired number of registers connected as described may be employed.

The amount of water evaporated and hence the degree of humidity given to the warm air discharged into the room may be varied considerably by opening or closing more or less one or both of the valves 30; but with the valves properly set, the vaporizer will naturally be greater or less according to whether the hot products of combustion passing through the device are increased or decreased. Obviously, the hotter the air, the greater will be its moisture-absorbing action and, moreover, the colder the weather and the greater the heat energy expended, the greater should be the amount of water evaporated to maintain proper humidity in the room. The evaporating plate 11 in the arrangement described, has been found to be a very efficient means for vaporizing the water. The total conducting capacity of the several tubes 14 should be at least as great and preferably considerably greater than the conducting capacity of the stack sections 10 or 10^a, so that there will be no choking up of the draft in passing the products of combustion through the device.

In the summer time, or hot weather, when it is desired to cool air delivered into the room or building, the fan 23 will be set into action and fine sprays of water will be delivered into the casing through more or less

and if required, through all of the nozzles 31—33. These nozzles can be set so that the several sprays will cross each other and all air passed through the casing will have to pass through the water vapor, thereby cooling the air both by direct contact and by evaporation. The tubes 14 will be sprayed with the water and kept cool so that the air comes repeatedly into contact with colder surfaces. This cooling operation, as indicated, requires forced circulation of the air such as produced by the operation of the fan or blower.

The auxiliary device or attachment described has, in practice, been highly efficient for all of the purposes had in view. It has many advantages such as low cost of construction, and ease of application, and is a relatively small self-contained structure, requiring no floor space, but well-adapted to be directly supported from the smoke hood or outlet from a furnace.

What I claim is:

1. In a device of the kind described, a casing adapted to be interposed in the smoke outlet of the furnace, an evaporating sheet extending across the lower portion of said casing and affording a flue sheet, and upper flue sheets spaced from the top of said casing, flues extending through and connecting said lower and upper flue sheets, and means for delivering water in limited quantities onto said lower evaporating flue sheet, air passages leading to and from said casing, and a drain extending from the upper surface of said evaporating flue sheet and preventing accumulation of water thereon.

2. In a device of the kind described, a casing arranged to be interposed in the smoke outlet of a furnace, an evaporating plate extended across the lower portion of said casing and affording a flue sheet, an upper flue sheet spaced from the top of said casing, flues extended through and connecting said lower and upper flue sheets, means for delivering water in limited quantities onto said lower evaporating flue sheet, and air passages leading to and from said casing, and baffle plates interposed between said flues and casing, the air passing through said casing to take alternately an upward and downward course.

3. In a device of the kind described, a casing arranged to be interposed in the smoke outlet of a furnace, an evaporating plate extended across the lower portion of said casing and affording a flue sheet, an upper flue sheet spaced from the top of said casing, flues extended through and connecting said lower and upper flue sheets, means for delivering water in limited quantities onto said lower evaporating flue sheet, and air passages leading to and from said casing, said lower evaporating flue sheet being formed with a multiplicity of pockets for

retaining shallow pools of water, and said casing having an overflow leading therefrom adjacent the surface of said lower flue sheet.

4. The structure defined in claim 1 in which said lower evaporating flue sheet is formed with a plurality of shallow pockets including annular pockets surrounding the lower ends of the flues, and said casing having an overflow leading substantially from the upper portion of said lower evaporating flue sheet.

5. The structure defined in claim 2 in which the pockets in said lower evaporating flue sheet are formed by corrugations and shallow annular pockets surrounding the lower ends of said flues.

6. The structure defined in claim 2 in which the pockets in said lower evaporating flue sheet are formed by corrugations and shallow annular pockets surrounding the lower ends of said flues, the crowns of the corrugations of said evaporating flue sheet having depressed channels affording communication between the valleys of corrugations.

7. The structure defined in claim 2 in which the water supply means and said casing includes water pipes with discharge nozzles located both in the upper and lower portions of said casing.

8. The structure defined in claim 1 in further combination with a motor-driven fan including a rotor and a casing therefor, a register for the discharge of air having an air pipe connected to the outlet of said fan casing, and an air discharge pipe extended from said casing and having branches, one connected to the intake of said fan casing and the other to the air pipe of said register, said water supply means including nozzles arranged for the delivery of water into both the upper and lower portions of said casing.

In testimony whereof I affix my signature.

HARRY L. BRADY.