April 12, 1932. W. O. SAGER 1,853,461

HEATING APPARATUS

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Fig. 1.

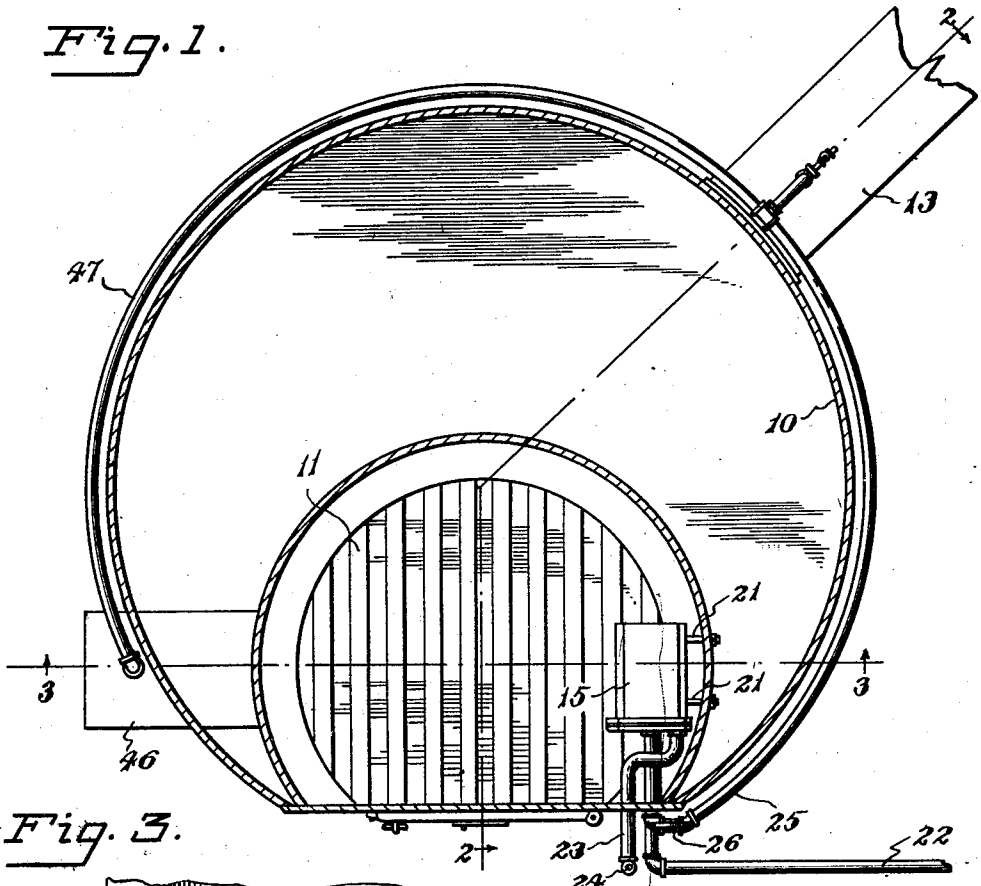
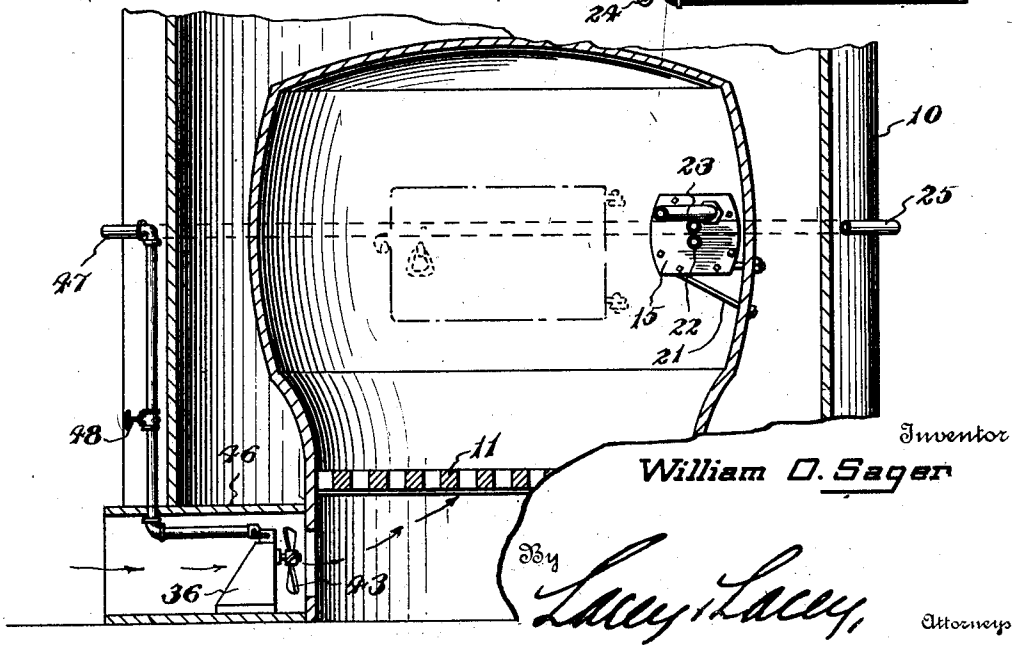


Fig. 3.



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HEATING APPARATUS

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Fig. 2.

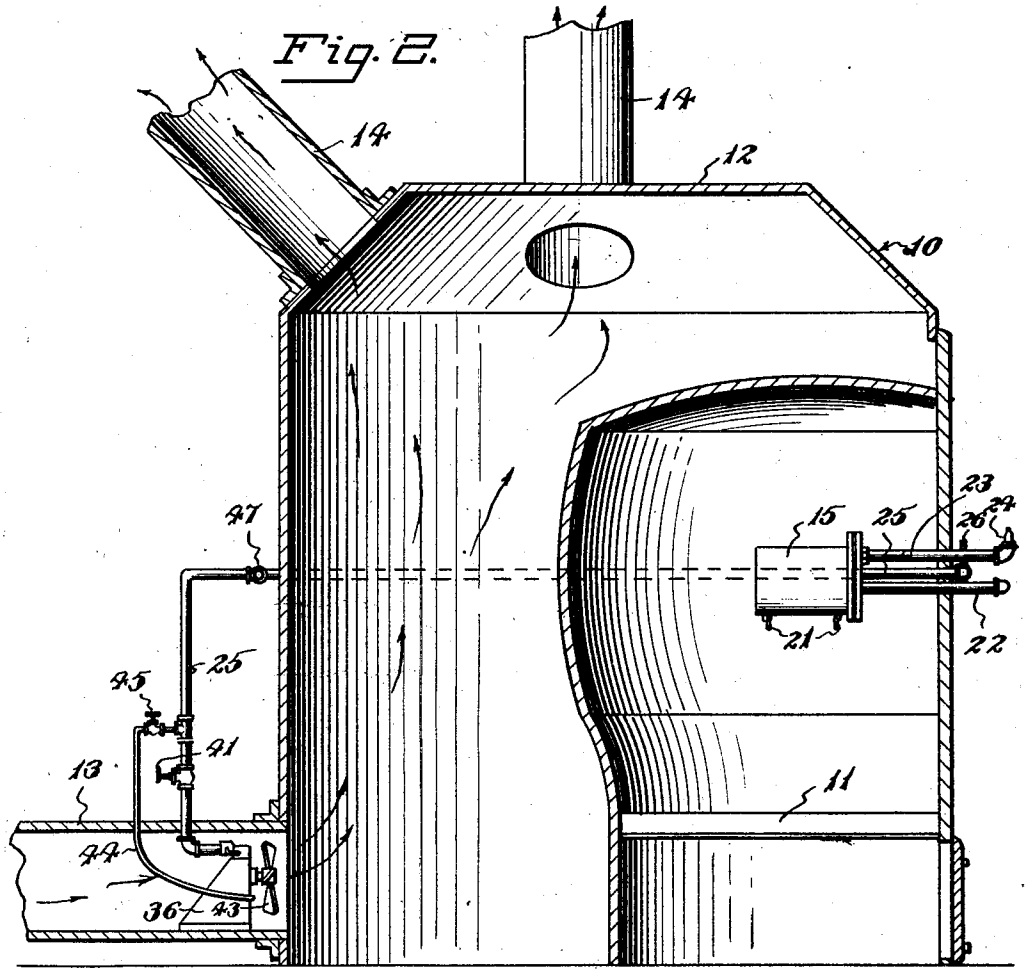
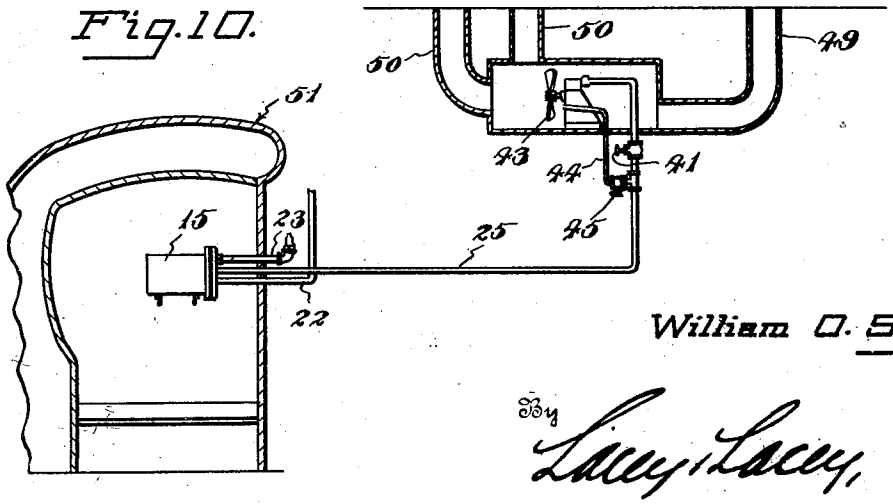


Fig. 10.



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HEATING APPARATUS

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Fig. 4.

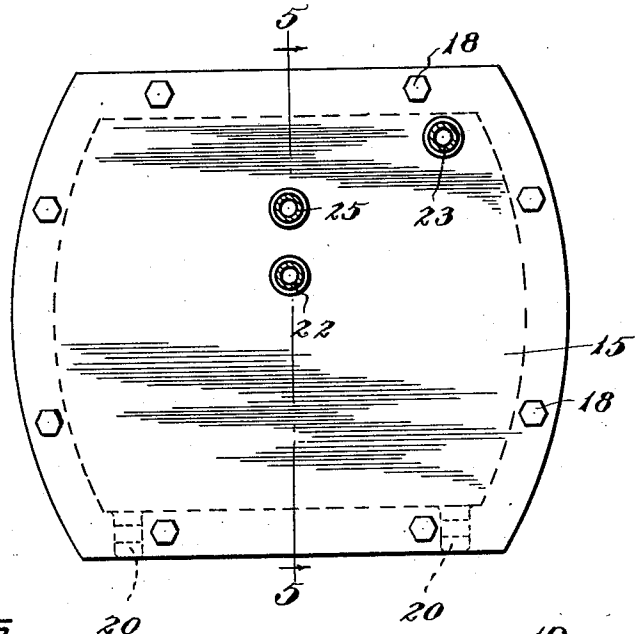


Fig. 5.

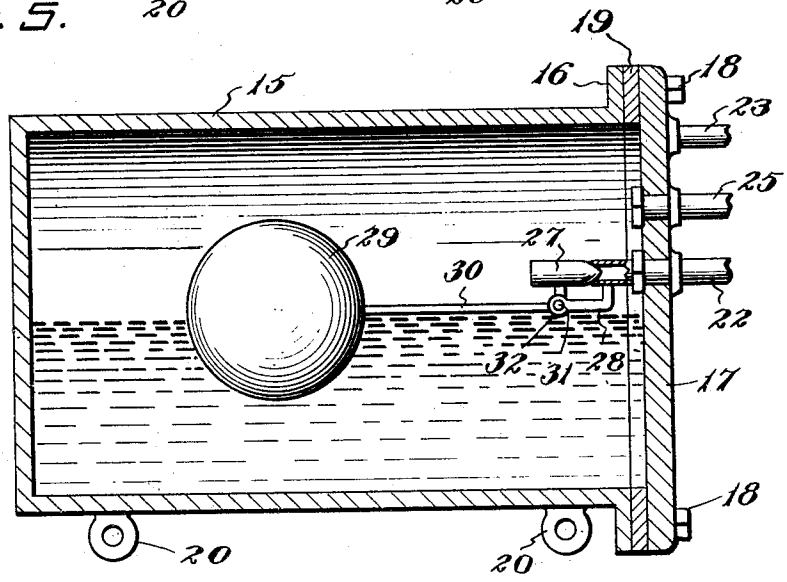
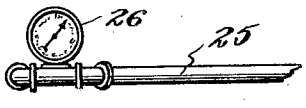


Fig. 9.



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HEATING APPARATUS

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Fig. 6.

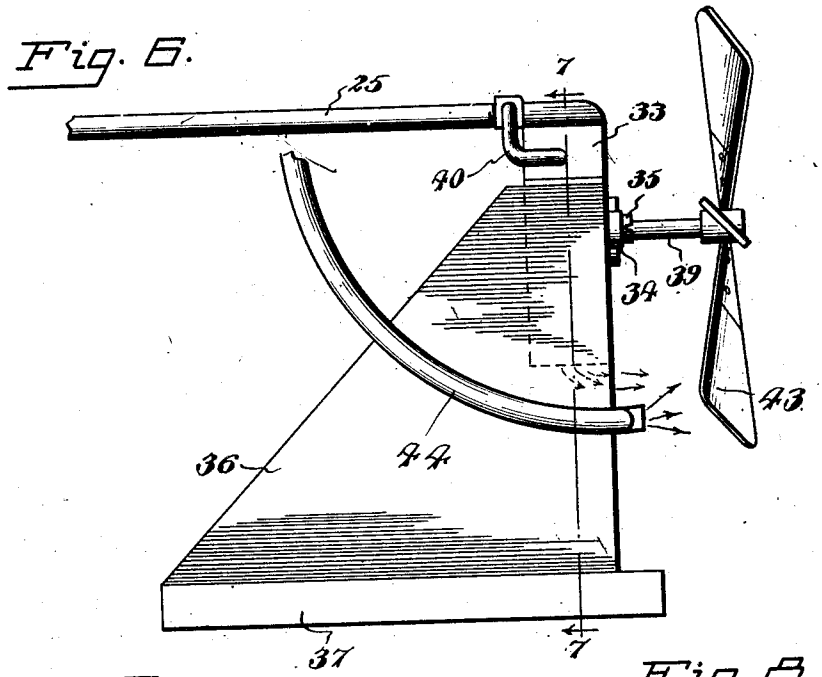


Fig. 7.

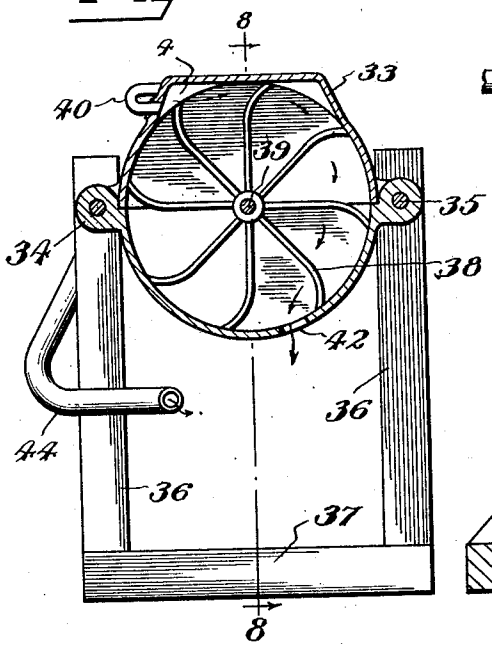
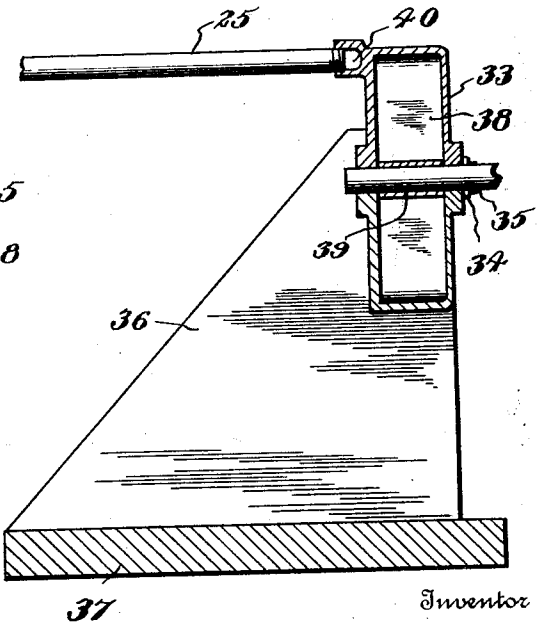


Fig. 8.



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Patented Apr. 12, 1932 1,853,461

UNITED STATES PATENT OFFICE

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HEATING APPARATUS

Application filed May 15, 1930. Serial No. 452,728.

This invention relates to humidifiers for furnaces and has for an object to provide apparatus for moistening the air heated by the furnace preparatory to its being distributed over the areas to be heated.

A further object is to provide apparatus for simultaneously insuring proper humidity, forced circulation of air and forced draft for coal or gas burning air heaters.

A still further object is to provide apparatus which will automatically maintain a proper humidity relative to temperature and which will combine essentially only major parts consisting of an auxiliary steam boiler preferably located in the dome of the furnace and a pair of steam driven fans, one being located in the cold air pipe and the other underneath the fire box.

A still further object is to provide an auxiliary steam boiler which will be fed from the house water line and when installed will be automatic in operation so that the water level will be maintained constant, a novel float control valve being utilized for this purpose.

A still further object is to provide a novel steam motor and fan driven thereby, the exhaust steam from the motor being utilized as the humidifying agent.

A still further object is to provide humidifying apparatus which will be inexpensive to manufacture and composed of a few rugged and durable parts which will not easily get out of order and which may be readily applied to furnaces now in use as well as to new heating units.

With the above and other objects in view the invention consists of certain novel details of construction and combinations of parts hereinafter fully described and claimed, it being understood that various modifications may be resorted to within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings forming part of this specification:

Figure 1 is a horizontal sectional view through a hot air furnace showing my improved humidifying and forced draft apparatus applied thereto,

Figure 2 is a vertical cross section taken on the line 2—2 of Figure 1,

Figure 3 is a vertical cross section taken on the line 3—3 of Figure 1, and showing the humidifier in front elevation,

Figure 4 is a front elevation of the auxiliary steam boiler,

Figure 5 is a longitudinal sectional view taken on the line 5—5 of Figure 4,

Figure 6 is a side elevation of the steam motor and circulating fan and by-pass,

Figure 7 is a cross sectional view taken on the line 7—7 of Figure 6,

Figure 8 is a longitudinal sectional view taken on the line 8—8 of Figure 7,

Figure 9 is a fragmentary detail view showing the steam gauge in the steam line, and

Figure 10 is a detail sectional view partly diagrammatic showing the humidifying apparatus applied to a steam or hot water heating system.

Referring now to the drawings in which like characters of reference designate similar parts in the various views, 10 designates a coal burning hot air furnace of the usual and well known type having a fire box 11, a hot air circulating space or dome 12, a cold air pipe 13 which receives the cold air from the floors of the rooms, and warm air pipes 14 which lead to the rooms.

In carrying out the preferred embodiment of my invention there is provided an auxiliary metal boiler 15 which is adapted to be located in the furnace over the coal bed. The boiler is substantially rectangular in outline, as best shown in Figures 4 and 5. The front of the boiler is provided with a flange 16 which is closed by a disk head 17 through which and the flange 16 clamping bolts 18 are passed. An asbestos packing ring 19 is disposed between the flange 16 and the head 17.

The boiler is provided on the bottom with supporting eyes 20. A plurality of bolts 21 are connected to the eyes and are secured to the furnace wall by their nuts. Other means of mounting the auxiliary boiler may be employed in lieu of the bolts and eyes

illustrated. The boiler is connected to the house water line by a pipe 22 which preferably enters the boiler through the head 17 thereof, as shown in Figures 4 and 5. A steam pipe 23 is also passed through the head of the boiler and enters the steam space thereof, this pipe extending exteriorly of the furnace, as best shown in Figure 1, and being equipped with a safety valve 24 which may be set to blow off at any desired pressure. It will be here pointed out that this boiler is designed preferably to carry a pressure of eight to twelve pounds, although a greater or less pressure may be carried if desired, as the boiler is capable of withstanding pressure up to one-hundred pounds per inch which is many times its normal pressure requirement. A steam pipe 25 also is passed through the head 16 and enters the steam space of the boiler, this pipe leading to the steam motor, as will presently be described. The steam pipe 25 is equipped with a pressure gauge 26, see Figure 9, installed outside the furnace or heater so that in operation the actual steam pressure may be determined at any time.

It will be observed that the water supply pipe 22, the steam blow-off pipe 23 and the steam pipe 25 all enter the fire chamber through suitable openings formed in the iron frame at the side of the fire pot door. This eliminates any danger of gas leakage into the natural air circulating channels to the rooms. It will be further observed that the boiler is located close to the side wall of the heating chamber and by virtue of the side walls of the boiler being slightly curved the boiler will conform compactly to the contour of the furnace, as best shown in Figure 3.

For automatically controlling the water level in the auxiliary boiler a valve 27, see Figure 5, is pivoted on a bracket arm 28 and is adapted to seal the open end of the water pipe 22. A float 29, preferably consisting of a metal ball, is provided with a stem 30 which is bent upwardly as shown, and rigidly secured to the valve 27. A pivot pin 31 is passed through the stem and through a hinge eye 32 formed on the bracket 28 and pivotally mounts the valve 27 to move as a unit with the float 29. The water level is preferably maintained at about one-half the vertical diameter of the boiler, as best shown in Figure 5.

Referring now more particularly to Figures 6, 7 and 8, it will be seen that the steam motor comprises a housing 33 having laterally disposed exterior eyes 34. These eyes are preferably bolted as shown at 35 to the uprights 36 of a base 37. The base of the housing is so proportioned to permit of the motor being located in the cold air pipe 13, as best shown in Figures 1 and 2.

Within the motor housing there is disposed a rotor comprising a plurality of blades 38, as best shown in Figure 7. These blades are rigidly secured to a shaft 39 which is suitably journaled in the walls of the housing and extends forwardly through the front wall of the housing. The above mentioned steam pipe 25 enters the housing through a nozzle pipe 40 positioned to direct the steam against the blades from a point located laterally in the housing and adjacent the top thereof. The steam pipe is controlled by a valve 41. The motor housing is provided with an exhaust port 42 disposed at the bottom thereof. The exhaust steam from the port 42 constitutes the humidifying agent.

Fixed to the projecting end of the motor shaft 39 is a fan 43 and this fan may be equipped with any desired number of blades. The fan serves to create a forced draft for accelerating the flow of cold air and the humidifying steam from the exhaust port 42 through the heating space or natural hot air channel of the furnace and through the warm air pipes into the rooms.

A by-pass steam pipe 44 is connected to the steam pipe 25 beyond the valve 41, as best shown in Figure 2. The by-pass is equipped with a controlling valve 45. The by-pass is preferably carried along one of the uprights 36 of the motor base and is provided with an open end located in rear of the fan 43 so that steam from the by-pass will be forced by the fan along with the cold air and through the natural warm air channel of the furnace.

The purpose of the by-pass is as follows. Since the motor will operate on a small amount of steam, controlled by the valve 41, a minimum amount of water content in the air circulating channel of the furnace results. Should the operator desire to increase the humidity without increasing the speed of the motor it is simply necessary to open the valve 45 of the by-pass to the desired extent and thus supply an additional amount of steam through the by-pass to the fan blades. Moreover, if desirable, the motor may be shut off entirely and the admission of steam through the by-pass alone may be employed to humidify the air. The function of the by-pass, therefore, is to permit flexibility in the operation of the device.

By referring now to Figure 3, it will be observed that preferably a motor and fan constructed as above described are also located in a metal boot 46 which enters the furnace below the grate 11. This motor is supplied with live steam from the boiler 15 by means of a pipe 47 which is connected to the above mentioned steam pipe 25 and is controlled by a valve 48. Since this motor and the parts thereof are duplicates of the corresponding motor located in the cold air pipe, with the exception that the by-pass is eliminated, the same materials have been applied thereto for the purpose of brevity.

From the above description it will be observed that the humidifying and forced draft apparatus above described is adapted to be easily connected with the ordinary house water supply and is automatically maintained at an even water content by the float and valve within the auxiliary boiler.

In operation steam enters the motor disposed at the furnace outlet of the cold air return pipe 13, through the pipe 25 from the boiler 15, and after furnishing power to operate the fan leaves the motor at the exhaust port 42. The exhaust steam is picked up by the fan suction, is mixed with the cold air drawn from the floors and is circulated around the heating dome 12 and from thence passes to the warm air pipes 14. The operation is entirely automatic, it will be observed, and the only cost of such operation is the cost of the water used by the auxiliary boiler.

It will be pointed out that the amount of steam generated and the speed of circulation of cold air from the floors through the furnace or heater where it is humidified by the exhaust steam depends upon the heat of the fire, that is with a hot fire, the more rapid is the steam generation, which results in faster operation of the fan and more rapid forced circulation of air and moisture through the heater. With a low fire such rapid circulation is not desirable and as the steam pressure falls the circulating fan is automatically slowed down until the fire is again brought up by a natural or forced draft.

By virtue of the motor and fan being hooked to the steam line 25 by the pipe 47 and connected with an opening in the ash pit, forced circulation is provided which makes possible the proper combustion of the cheaper grades of coal which will only burn efficiently under forced draft.

While my improved humidifying and forced draft system has been illustrated in connection with a hot air furnace, it is equally well applicable to a steam boiler or hot water heater. It is simply necessary to install cold air outlets 49, see Figure 10, in the floors and warm air pipes 50 to such openings in the rooms as are desired. The fan operates in this modified installation to draw the cold air from the floors, humidifying it with the exhaust from the motor, and forces the air through the warm air return pipes to the rooms. This modified installation, it will be observed, is entirely independent of the steam boiler with the exception that the auxiliary boiler may be installed in or on the steam boiler 51.

From the above description it will be thought that the construction and operation of my invention will be understood without further explanation.

Having thus described the invention, I claim:

1. The combination with a hot air furnace, of a humidifier comprising a steam generator heated by the furnace, a steam-driven motor fan unit disposed in the cold air return pipe of the furnace and operatively connected to the humidifier for causing a forced draft to the hot air pipes of the furnace, and a by-pass for conducting steam around said unit to a point in advance thereof, the exhaust steam from said unit and the steam from said by-pass being driven by the fan of the unit to said hot air pipes and constituting a humidifying agent under forced draft.

2. The combination with a hot air furnace, of a humidifier comprising a steam generator operatively connected to the furnace to be heated thereby, a water supply pipe entering said humidifier, a float controlled valve for said pipe, a steam pipe connected with said humidifier, a steam motor fan unit connected with said pipe and located in the cold air return pipe of the furnace, and a by-pass connected with said steam pipe and discharging at a point in advance of said motor fan unit, the exhaust steam from said unit and the steam from said by-pass being driven by the fan of the unit to the hot air pipes of the furnace and constituting a humidifying agent under forced draft.

3. The combination with a hot air furnace, of a humidifier comprising a steam generator mounted in the furnace above the grate, a water supply pipe entering said humidifier, a float controlled valve for said pipe, a safety valve and pressure gage operatively connected with said humidifier and exposed exteriorly of the furnace, and a steam-driven motor fan unit operatively connected to said humidifier and located in the bottom of the furnace in the mouth of the cold air return pipe of the furnace, the steam from the humidifier after operating the motor fan unit escaping through a port in the unit housing and being driven by the fan of the unit to the hot air pipes of the furnace and constituting a humidifying agent under forced draft.

4. The combination with a hot air furnace, of a humidifier comprising a steam generator disposed within the furnace, a water pipe for supplying the humidifier, a float valve controlling said pipe, a steam pipe for conducting steam from said humidifier, and a plurality of steam-driven motor fan units located at the bottom of the furnace and operatively connected with said steam pipe, one of said motor fan units being disposed in the mouth of the cold air return pipe of the furnace, and another of said motor fan units being disposed below the grate of the furnace to cause a forced draft through the fire box of the furnace, said motor fan units having exhaust ports permitting of the steam escaping in advance of the fans of the units after operating the motors to supply steam laden

air under forced draft created by the fans to the furnace.

5. The combination with a hot air furnace, of a humidifier comprising a steam generator in the furnace, a steam-driven motor fan unit operatively connected with the humidifier and disposed in the cold air return pipe of the furnace for subjecting the cold air to the action of the humidifying steam under forced draft created by the fan of the unit, and a steam by-pass operatively connected to the humidifier and discharging into the cold air pipe in advance of the motor fan unit to supply additional humidifying steam under forced draft created by the fan of the unit.

6. The combination with a heater and an air circulating conduit, of a humidifier comprising a steam generator heated by the heater, a steam driven motor fan unit disposed in said air conduit and operatively connected to the humidifier for causing a forced draft, and a by-pass for conducting steam around said unit to a point in advance thereof, the exhaust steam from said unit and the steam from said by-pass being driven by the fan of the unit and constituting a humidifying agent under forced draft.

In testimony whereof I affix my signature.

WILLIAM O. SAGER. [L. S.]