March 27, 1928. 1,664,317

R. J. PABODIE

HEATING SYSTEM

Filed April 21, 1927 4 Sheets-Sheet 1

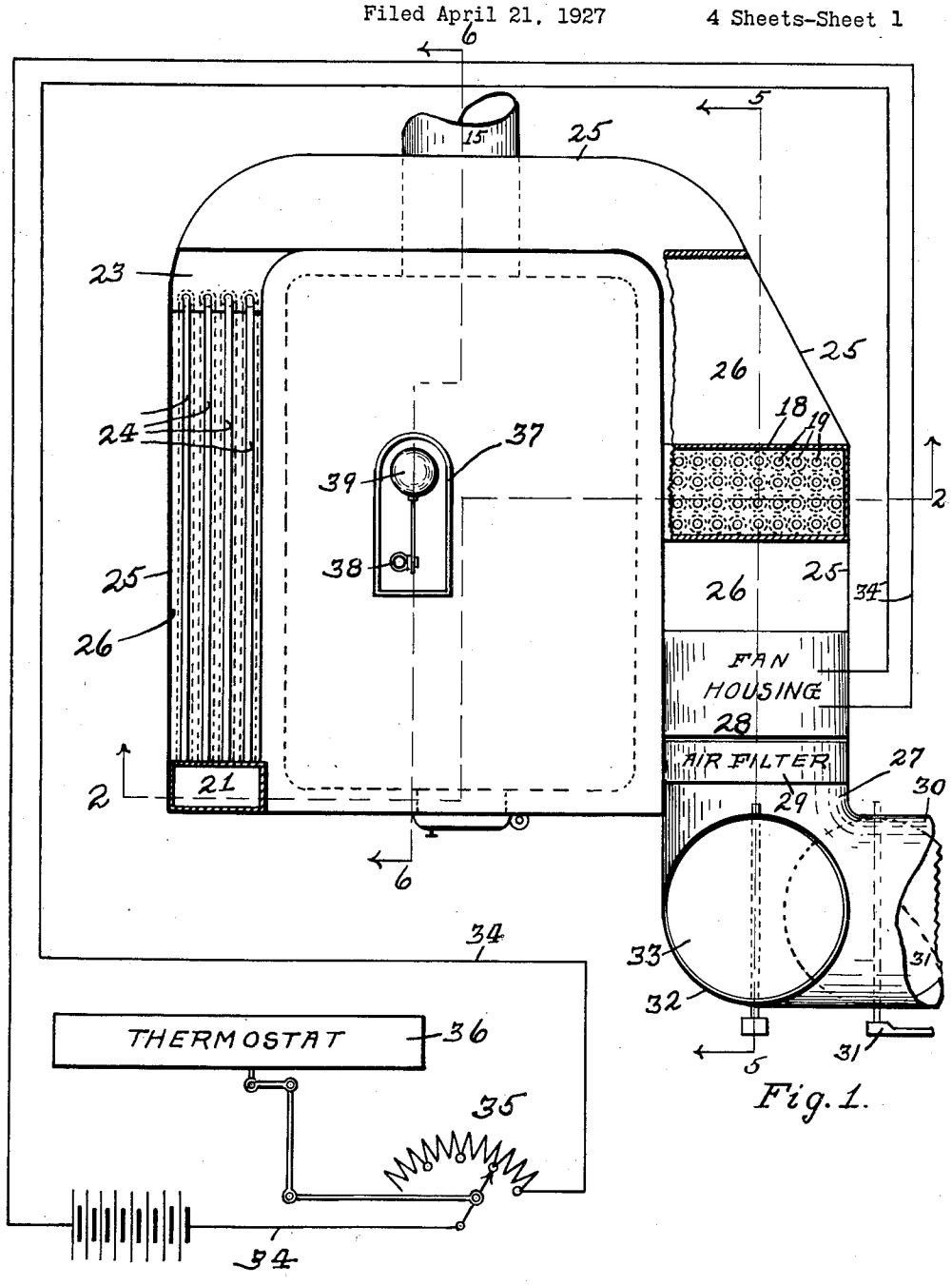


Fig. 1.

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Filed April 21, 1927 4 Sheets-Sheet 2

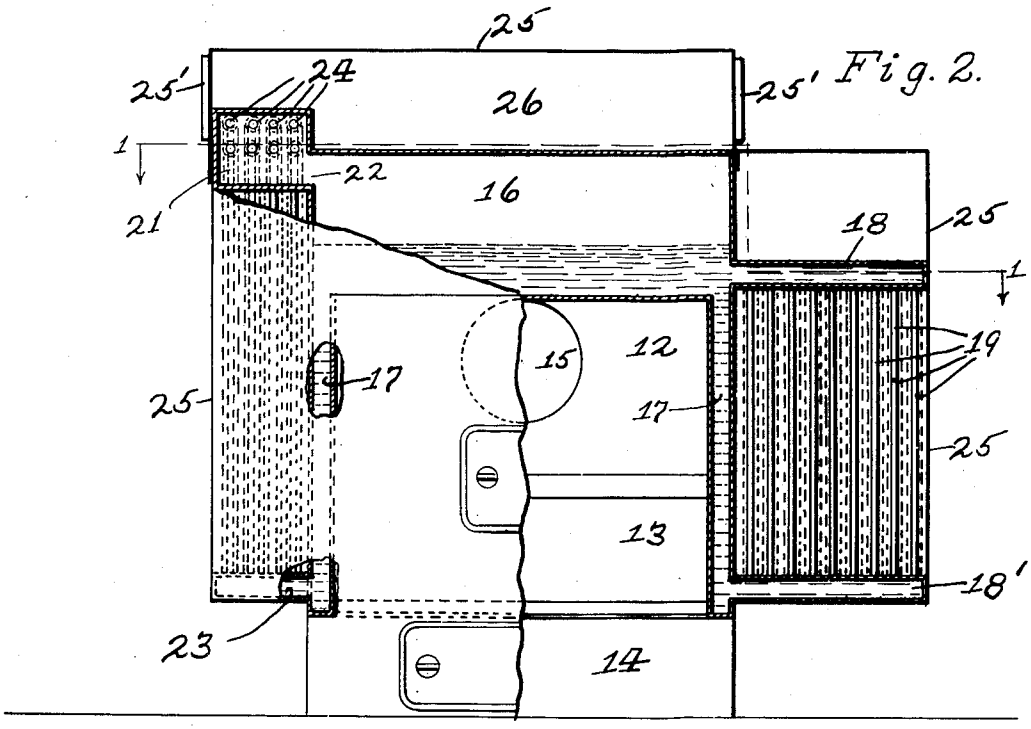


Fig. 2.

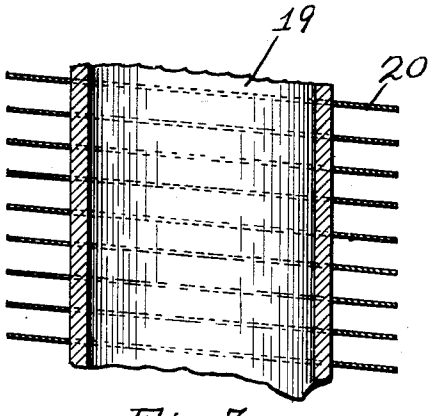


Fig. 3.

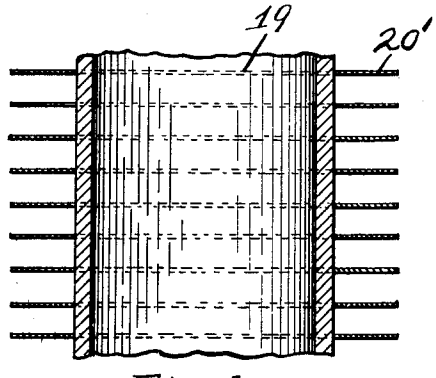


Fig. 4.

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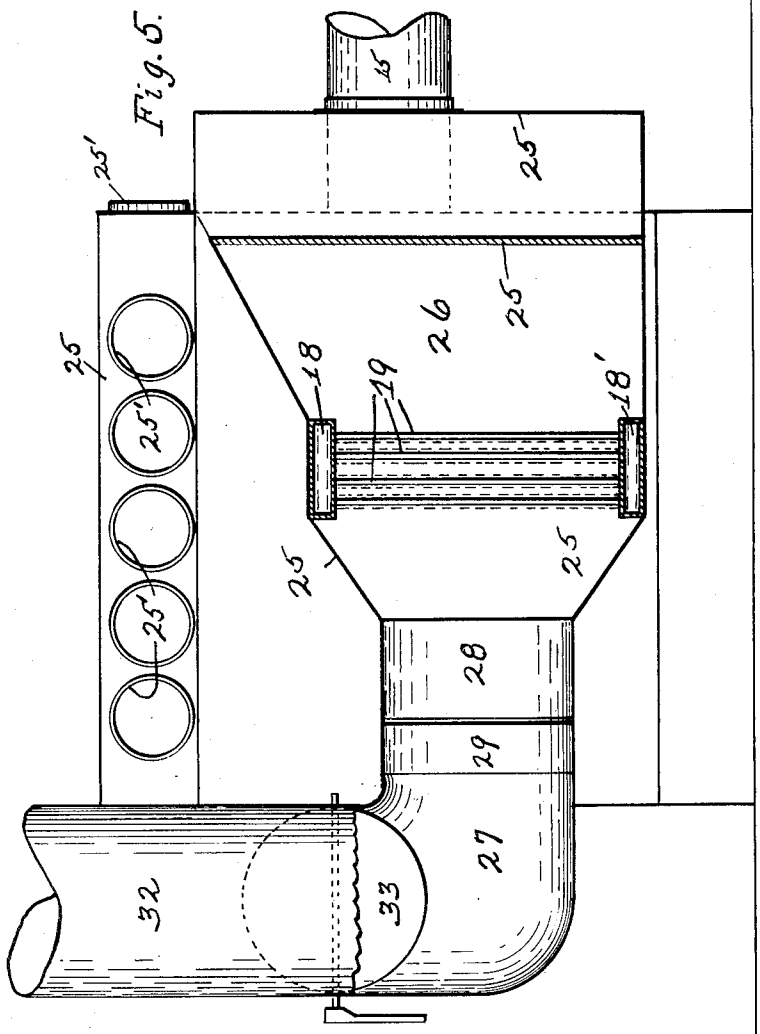
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Fig. 5.



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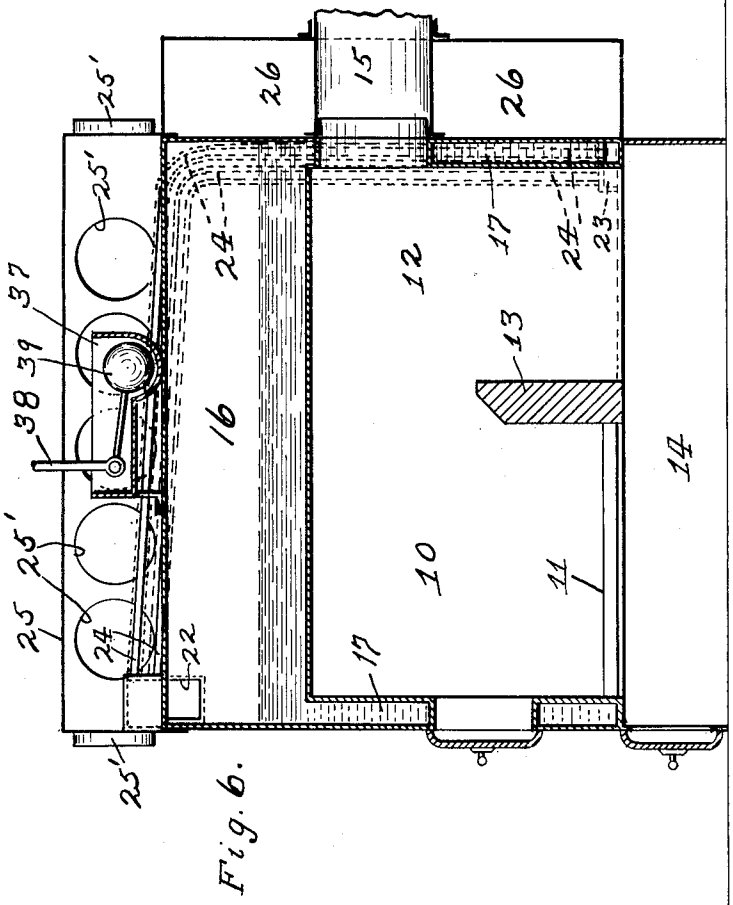


Fig. 6.

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Patented Mar. 27, 1928. 1,664,317

UNITED STATES PATENT OFFICE.

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HEATING SYSTEM.

Application filed April 21, 1927. Serial No. 185,618.

The invention relates to heating systems especially adapted for use in heating residences, and has for its object the provision of an improved system of this character, capable of economical construction and highly efficient in use.

Another object of the invention is the provision of a heating system of this character containing all of the advantages, and none of the disadvantages, of the usual steam and hot water heating systems.

Another object of the invention is to provide a heating system operating either by means of a forced draft of hot air or by circulation induced by convection.

Other objects will appear hereinafter.

In general the objects of the invention are attained by providing a boiler setting of any usual or desired design and arranging a hot air flue in association therewith so as to receive heat therefrom. Arranged in this hot air flue are both hot water and steam heating pipes operatively connected with the boiler and whereby the air passing through the air flue may be subjected to the action of the hot water pipes or tubes alone or in conjunction with the steam pipes or tubes. An electric fan is also arranged in the air flue and controlled by a thermostat whereby a forced draft of air may be caused through the air flue. A suitable air filter and humidifier are provided in the air flue and performing the usual functions therein.

The invention consists in the combinations and arrangements of parts hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification and in which,

Fig. 1 is a horizontal section taken substantially on line 1—1 of Fig. 2, of a hot water heating system embodying the invention;

Fig. 2 is a vertical section taken substantially on line 2—2 of Fig. 1;

Fig. 3 is an enlarged detail section of a portion of a heating tube employed in the construction;

Fig. 4 is a similar view of a slightly different form of heating tube;

Fig. 5 is a section taken substantially on line 5—5 of Fig. 1, and

Fig. 6 is a vertical section taken substantially on line 6—6 of Fig. 1.

The preferred form of construction as illustrated in the drawings comprises a boiler setting of any usual or desired form and comprising a fire chamber 10 having a grate 11 therein adjoining a combustion chamber 12 partially separated therefrom by the usual bridge wall 13. The usual ash pit 14 is arranged in the lower portion of the setting and the usual smoke flue or pipe 15 leads from the upper and rear portion thereof. A rectangular boiler 16 is arranged over the combustion space thus provided and vertical water legs 17 are extended downwardly from said boiler constituting the four vertical walls of said combustion space.

Water heads 18 and 18′ are extended, respectively, from the upper and lower portions of the water leg at one side of the setting and vertical water heating tubes 19 are extended, as shown, between said water heads so as to permit of free circulation of water therethrough.

As indicated in Fig. 3, the water tubes are provided with helical fins 20, as shown, and whereby an efficient and rapid dissemination of heat from the contained water is effected.

In Fig. 4 is illustrated a modified form of heating tube provided with straight or horizontal fins 20′ which form of heating tube may also be used with equal effect.

A steam head 21 is extended from the upper forward portion of the boiler 16 at the other side thereof and in open communication with the steam space of the boiler 16 through opening 22 as best shown in Fig. 2. A water head 23 is arranged at the rear lower side of the setting to cooperate with the steam head 21 and in open communication with the corresponding water leg of the boiler, as best shown in Fig. 2.

Steam heating tubes 24 are extended between the steam head 21 and the water head 23, said steam tubes or pipes extending from the head 21 rearwardly at a slight downward inclination until over the water head 23 when they turn and extend downwardly substantially vertically into said water head, as best shown in Figs. 2 and 6.

The tubes or pipes 24 are identical in construction with the tubes or pipes 19 and may be provided with either the fins 20 or 20′ as desired.

A sheet metal casing 25 is arranged to extend along the side of the boiler to enclose

the water tubes 19, thence around the rear of the boiler and thence up along the other side of the boiler and over the top thereof, constituting and forming an air flue passing around the boiler and up over the top thereof and enclosing said hot water and steam heating tubes or pipes. The upper portion of said casing is provided with suitable lateral openings and surrounding flanges 25′, by means of which air pipes or ducts may be readily attached to the system for conducting the heated air to the various registers of the house or residence, as will be readily understood.

An entry pipe 27 is provided at the entry end of the air flue 26 and an electric fan 28, and suitable air filters 29 are inserted in said entry pipe 27, as shown. A branch pipe 30 is connected with the entry pipe 27, said branch pipe 30 constituting a cold air duct and leading to the outside of the residence for conducting fresh air into the system, as is usual in such systems. The branch pipe or duct 30 is provided with a suitable damper 31, by means of which the quantity of fresh air introduced into the system may be controlled as desired. Another branch pipe or duct 32 is connected with the pipe 27 and arranged to constitute the usual air return duct or flue arranged in the usual way to return the air from the residence being heated for reheating as is also usual in hot air heating systems for residences. A suitable damper 33 is provided for the pipe or duct 32 whereby, in conjunction with the damper 31 the portion of fresh air introduced into the residence may be regulated as desired.

The fan 28 is connected by the wires 34 in circuit with a rheostat 35 arranged, as indicated, to supply said fan with controlled electric current for operating the same. The rheostat 35 is connected with a thermostat 36 whereby the operation of said fan may be automatically controlled by the heat as will be readily understood by those skilled in this art. The thermostat 36 is located at some convenient point in the residence to be heated and the arrangement indicated diagrammatically in Fig. 1 will thus serve to control automatically the operation of the fan 28, and thereby control and regulate the heating effect of the system.

A water pan 37 is arranged on top of the boiler in the upper portion of the air flue 26 and a suitable inlet pipe 38 is extended thereto as shown. The inlet pipe 38 is controlled by a suitable float and valve 39 as will be readily understood and whereby a suitable supply of water is always maintained in the pan 37 for humidifying the air passing through said air flue.

In operation a suitable fire or other means of heating the boiler is maintained in the combustion space provided therefor. In mild weather the heating means is operated to produce only hot water and the air passing through the air flue will, therefore, be subjected only to the action of the hot water tubes and thereby only mildly heated.

In colder weather the boiler is operated to generate steam and whereby the air passing through the air flue will also be subjected to the action of the steam in the horizontally extending portions of the tubes or pipes 24. Under such circumstances also the rear and vertical portions of the tubes 24 constitute hot water heating tubes for the air. The air will pass rearwardly through the right hand side of the air flue across the rear of the boiler and upwardly through the left hand side of the flue into the portion of the flue on top of the boiler, whence it will be distributed to the various registers through pipes connected with the flanges or nipples 25′. Any flanges or nipples not in such use may be closed by suitable caps. In this way in severe weather the system may be operated to obtain the advantages of both hot water heat and steam heat. Also, if desired, the system may be operated without the fan 28, in which case the circulation of the air will be only that induced by convection or the heating thereof, which will ordinarily be sufficient in mild weather.

In colder weather the forced circulation may be employed as desired.

The use of the apparatus thus disclosed will result in fuel economy and low smoke stack temperatures; a low combustion rate of fuel; will permit the use of low grade fuels when desired; will prolong the life of the boiler owing to the effect of the water legs thereof; will avoid the use of radiators of any description thus avoiding the cost and disadvantages thereof; will provide suitable and proper ventilation always under control without the opening of doors or windows and the consequent drafts; will produce proper humidification of the heated air with resulting well known advantages thereof; will provide means for readily controlling the heat delivered to the different rooms of a residence or the like; due to the forced circulation of the air will permit of the use of comparatively small air ducts and registers. By eliminating solid particles from the circulated air it will prevent the spoiling of wall paper and hanging and generally tends to a more healthy living condition; by passing the circulated air over the outer noninsulated surfaces of the boiler heat is picked up thereby which would otherwise be lost by radiation; and a generally efficient and economical system is provided for heating residences and the like.

In brief and in general by means of the arrangement set forth, there is combined in one unit a steam or hot water heating boiler and selective means for effecting forced or convective circulation of the heated air.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

I claim:

1. A heating system comprising a boiler; a hot air flue; heating elements in said flue and connected to be supplied with steam from said boiler; and heating elements in said flue connected to be supplied with hot water from said boiler.

2. A heating system comprising a boiler; a hot air flue; steam heating tubes in said flue and connected to be supplied with steam from said boiler; and hot water heating tubes in said flue connected to be supplied with hot water from said boiler.

3. A heating system comprising a boiler; a hot air flue traversing said boiler and arranged to receive heat therefrom; steam heating tubes in said flue and connected to be supplied with steam from said boiler; and hot water heating tubes in said flue connected to be supplied with hot water from said boiler.

4. A heating system comprising a steam boiler; an air flue passing around the sides and over the top of said boiler; hot water tubes arranged in said air flue in open communication at both ends with the water in said boiler; steam tubes in said flue in open communication with the steam and water space of said boiler; an electrically driven fan arranged to cause a draft of air through said flue; and a thermostat arranged to control the operation of said fan.

5. A heating system comprising a steam boiler; an air flue passing around the sides and over the top of said boiler; hot water tubes arranged in said air flue in open communication at both ends with the water in said boiler; steam tubes in said flue in open communication with the steam and water space of said boiler; an electrically driven fan arranged to cause a draft of air through said flue; a thermostat arranged to control the operation of said fan; and an automatic float controlled humidifier in said flue arranged to introduce moisture into air passing through said flue.

6. A heating system comprising a steam boiler; an air flue passing around the sides and over the top of said boiler; hot water tubes arranged in said air flue in open communication at both ends with the water in said boiler; steam tubes in said flue in open communication with the steam and water space of said boiler; an electrically driven fan arranged to cause a draft of air through said flue; a thermostat arranged to control the operation of said fan; an air filter in said flue arranged to remove solid particles from air passing therethrough; and an automatic float controlled humidifier in said flue arranged to introduce moisture into air passing through said flue.

7. A heating system comprising a boiler setting consisting of a combustion space and a boiler thereover, said boiler being provided with vertical water legs constituting the sides of said combustion space; an air flue passing along one side, across the back, up the other side and over the top of said boiler setting; water-heads extending from the corresponding water leg into the upper and lower portion of the first mentioned portion of said air flue; vertical water tubes extending between said heads; a steam head extending from said boiler into the upper forward portion of the upwardly extending portion of said air flue; a water head extending from the corresponding water leg into the lower rear portion of said upwardly extending portion of said air flue; and steam pipes extending from said steam head rearwardly at a slight downward inclination to the rear portion of the setting and thence downwardly substantially vertically into said last mentioned water head.

8. A heating system comprising a boiler setting consisting of a combustion space and a boiler thereover, said boiler being provided with vertical water legs constituting the sides of said combustion space; an air flue passing along one side, across the back, up the other side and over the top of said boiler setting; water heads extending from the corresponding water leg into the upper and lower portion of the first mentioned portion of said air flue; vertical water tubes extending between said heads; a steam head extending from said boiler into the upper forward portion of the upwardly extending portion of said air flue; a water head extended from the corresponding water leg into the lower rear portion of said upwardly extending portion of said air flue; steam pipes extending from said steam head rearwardly at a slight downward inclination to the rear portion of the setting and thence downwardly substantially vertically into said last mentioned water head; and means for causing a forced draft of air through said flue.

9. A heating system comprising a boiler setting consisting of a combustion space and a boiler thereover, said boiler being provided with vertical water legs constituting the sides of said combustion space; an air flue passing along one side, across the back, up the other side and over the top of said boiler setting; a plurality of air ducts leading from the portion of said flue above the top of said boiler setting; water heads extending substantially horizontally from the

corresponding water leg into the upper and lower portion of the first mentioned portion of said air flue; vertical water tubes extending between said water heads; a steam head extending from said boiler into the upper forward portion of the upwardly extending portion of said air flue; a water head extending substantially horizontally from the corresponding water leg into the lower rear portion of said upwardly extending portion of said air flue; and steam pipes extending from said steam head rearwardly at a slight inclination to the rear portion of the setting and thence downwardly substantially vertically into said last mentioned water head.

10. A heating system comprising a boiler setting consisting of a combustion space and a boiler thereover, said boiler being provided with vertical water legs constituting the sides of said combustion space; an air flue passing along one side, across the back, up the other side and over the top of said boiler setting; a plurality of air ducts leading from the portion of said flue above the top of said boiler setting; water heads extending substantially horizontally from the corresponding water leg into the upper and lower portion of the first mentioned portion of said air flue; vertical water tubes extending between said water heads; a steam head extending from said boiler into the upper forward portion of the upwardly extending portion of said air flue; a water head extending substantially horizontally from the corresponding water leg into the lower rear portion of said upwardly extending portion of said air flue; steam pipes extending from said steam head rearwardly at a slight inclination to the rear portion of the setting and thence downwardly substantially vertically into said last mentioned water head; and means for causing a forced draft of air through said flue.

In witness that I claim the foregoing as my invention I affix my signature this 18 day of April, 1927.

ROBERT J. PABODIE.