E. C. KENT, L. GILES & G. A. LYSTER.

HOT AIR FURNACE.

APPLICATION FILED NOV. 12, 1912.

1,076,209. Patented Oct. 21, 1913.

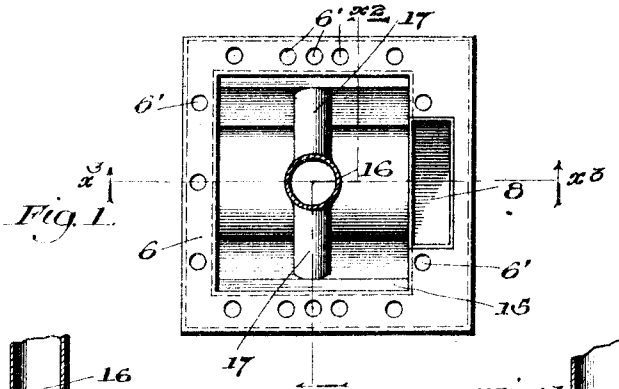


Fig. 1.

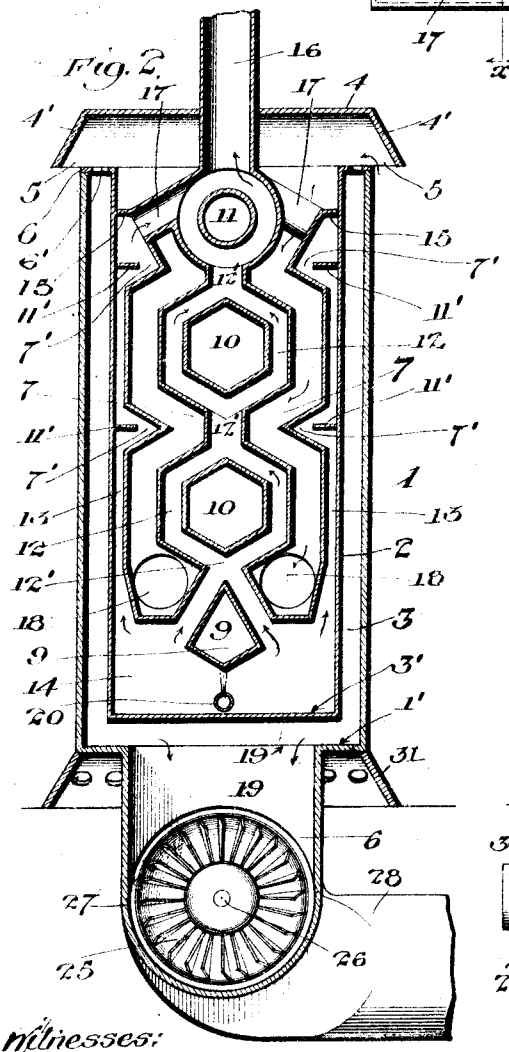


Fig. 2.

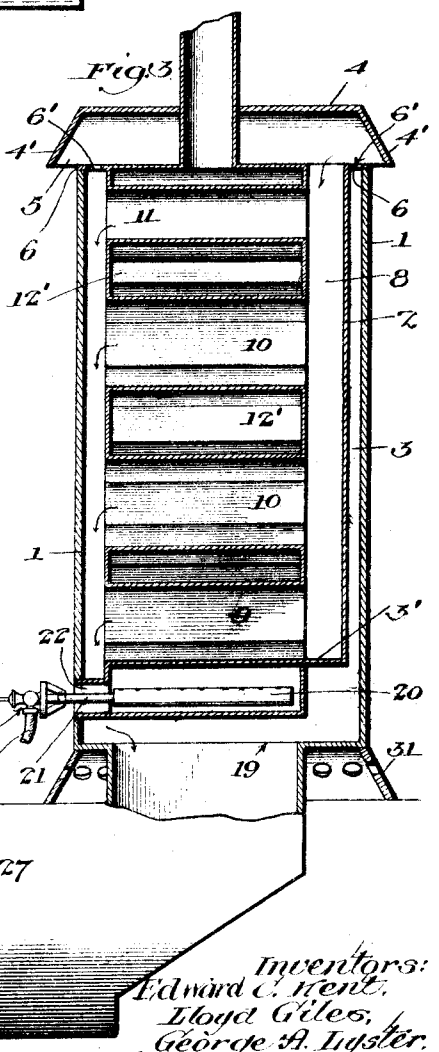


Fig. 3.

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UNITED STATES PATENT OFFICE.

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HOT-AIR FURNACE.

1,076,209. Specification of Letters Patent. Patented Oct. 21, 1913.

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To all whom it may concern:

Be it known that we, EDWARD C. KENT, a citizen of the United States, residing at Pasadena, Los Angeles county, California, LLOYD GILES, a citizen of the United States, residing at Venice, Los Angeles county, California, and GEORGE A. LYSTER, a subject of the United Kingdom of Great Britain and Ireland, residing at Los Angeles, Los Angeles county, California, have invented a new and useful Hot-Air Furnace, of which the following is a specification.

This invention relates to furnaces for hot air, and particularly to a furnace for this purpose in which gas or fluid fuel is used.

One object of the invention is to provide a hot air furnace in which the heated air is taken downwardly through and from the furnace instead of upwardly, so that the furnace is adapted to be used in buildings where there is no cellar or basement, and placed on or partly below the floor of the story to be heated.

A further object of the invention is to provide for drawing the air in an opposite direction to the current of products of combustion, thereby obtaining the greatest efficiency in heat transmission.

Other objects of the invention will appear hereinafter.

The accompanying drawings illustrate an embodiment of the invention, and referring thereto: Figure 1 is a plan of the furnace with the top removed. Fig. 2 is a vertical section on line x^2—x^2 in Fig. 1. Fig. 3 is a vertical section on line x^3—x^3 in Fig. 1.

The furnace comprises an outer shell or casing 1, and an inner shell or casing 2 supported within said outer shell or casing and spaced therefrom to form an intervening passage 3 between said shells, said passage 3 extending completely around the inner shell and from top to bottom thereof, and also extending beneath the inner shell. Said space 3 is closed at the top by a member 6 of sheet metal which is formed as a flange on the inner shell and extends over and rests on the top of the outer shell, so as to support the inner shell on the outer shell of casing 1, said member 6 having perforations 6′. The outer shell is supported by a base 31 adapted to rest on the floor of a room. The inner shell 3 has a closed bottom 3′ but is open at the top. The outer shell 1 is covered at the top by a hood 4, supported in any suitable manner, for example, by connection to chimney 16 for the furnace, having its side walls 4′ extending obliquely downward at each side of the outer shell 1, leaving a passage 5 between said outer shell and the hood portion 4′ for passage of air, as hereinbefore set forth. The bottom 1′ of the outer shell 1 is provided with an outlet opening 19 communicating with outlet pipe 6 leading to a blower or for drawing air downwardly through the air compartments of the heater. The inner shell 2 is provided with a vertical series of tubular compartments or air passages 9, 10, and 11 of prismatic or cylindrical form extending from one side wall to the opposite side wall of the inner shell 2, said inner shell walls being cut away to form openings at each end of said passages so that said passages communicate at one end with the space 3 around the inner shell 2, and at the other end with an air box 8, extending vertically alongside the corresponding end wall of inner shell 2, said air box being closed at the bottom and being open at the top. There are two air compartments or chambers 7 arranged respectively on the opposite sides of the said vertical series of tubular compartments, said chambers 7 being formed by partition walls comprising inner and outer wall portions forming between them an air compartment which is closed at the bottom and open at the top, and said inner and outer walls being bent substantially in conformity to one another, and to the shape of the tubular compartments 9, 10 and 11, so as to extend into the spaces 12′, between said tubular compartments. Baffle plates or deflectors 11′ are provided on the side walls of the inner shell, extending into the reëntrant angles 7′ of the outer wall portions of said chambers 7, said outer wall portions being separated from the adjacent side wall of the inner shell to form a passage 13 for the products of combustion. Each passage 13 opens at the lower end into a combustion chamber 14 and is closed at the upper end by a top plate 15. The inner walls of the two side air compartments 7 are spaced from the tubular members 9, 10 and 11 to form a passage 12, which extends around said tubular compartments and communicates at its lower end with the combustion chamber 14 and at

its upper end with a flue or chimney 16. Pipes 17 lead from the upper ends of the compartments 7 aforesaid at each side, to the central passage 16 aforesaid, leaving a space around each of said pipes through which air may pass downwardly into the air compartments 7, said air compartments being in communication at their lower ends through openings 18 in the end walls of the inner shell 2 with the space 3 around said inner shell.

The parts above described may be constructed of any suitable material, sheet iron being preferably used for the said shells, partitions and walls of the several compartments, passages and chambers.

A burner 20 is provided in the lower part of the inner shell 2, beneath the aforesaid compartments or passages extending through said shell, said burner having an inlet pipe 21 extending through a tubular member 22 connecting the inner and outer shells 2 and 1, and forming an air inlet surrounding the burner inlet pipe 21. The said burner inlet pipe 21 is provided with a mixing valve 23 connected to a gas supply pipe 24. The outlet 19 at the bottom of the outlet chamber 1, communicating with the space 3 extending around the inner chamber, is provided with means for drawing air from the furnace or heater and forcing it to any desired point or points, said means consisting, for example, of a fan or blower 25 mounted on a shaft 26 and located in a casing 27, communicating with said outlet and having an outlet pipe 28 connected to the hot air distributing system to be supplied by the furnace. The fan or blower may be driven by any suitable means, for example, by power applied to a pulley 30 on the shaft 26 thereof.

The operation is as follows: The burner 20 being started in operation, the hot gases or products of combustion therefrom, ascend through the passages 12, extending around the tubular compartments 8, 9, 10 and 11, and between said tubular compartments and the air compartments or chamber 7. Some of the heated products of combustion also pass through the side passages 13 between the air chambers 7 and the side walls of the inner shell so as to heat the outside of said air chamber and the walls of the inner shell, the baffle plates 11′ insuring effective contact of the hot gases with said walls. The fan or blower 25 being set in operation, draws air downwardly through the several air passages of the heater, the air passing in at the top through the inlet passage 5 and then down through the several air compartments and passages. Part of the air passes from the top of the furnace down through the air box 8, then through the several tubular compartments 9, 10 and 11 to the space 3 at the other end of said tubular compartments, then down through said space 3 to the outlet 19 at the bottom. Another portion of the air passes from the top of the heater into the inner shell 2, passing down through the air compartments or chambers 7 and out through the openings 18 at the bottom thereof, into the space 3 at one end of the inner shell and then down through said space 3 to the outlet 19. The air is thus divided into several streams and is brought into contact with a large heating surface, both the air and products of combustion being deflected repeatedly and thereby being brought into contact with the metallic heat conducting surfaces. The fact that the air is moved downwardly in the opposite direction to the movement of the heated products of combustion which pass upwardly through the furnace is of advantage in that as the air descends and becomes heated, it is brought into contact with metallic surfaces heated to a higher temperature as it comes closer to the burner, thereby obtaining greater heat transmitting efficiency for such surfaces and enabling the air to leave the furnace at a temperature more nearly that of the highest temperature of the products of combustion than is the case with natural draft heaters. A further important advantage of this construction of the furnace in which the outlet is at the bottom, is that the furnace or heater can be placed on the floor of the store to be heated or only partly beneath said floor and does not require to be placed wholly beneath said floor in a cellar or basement, as is the case where natural upward draft is depended upon. Sufficient air passes through the perforations 6′ in top plate 6 to insure circulation of the air in the upper part of space 3 and prevent said air from becoming overheated.

What we claim is:

1. In a hot air furnace, an outer casing, an inner shell closed at the bottom and open at the top, and spaced at all sides and at the bottom from the outer casing to form an outer air space, a perforated top member over the space between said casing and inner shell, an air box open at the top and extending down at one side of said inner shell, said inner shell having tubular compartments extending across said inner shell and communicating at one end with said outer air space and at the other end with said air box, outlet means communicating with the lower end of said outer air space, suction means in said outlet means for drawing air from said outer air space, a burner in the lower part of said inner shell, an outlet flue at the top of the furnace, and partition walls in said inner shell for directing the products of combustion against said tubular compartments, and into said outlet flue.

2. In a hot air furnace, an outer casing, an inner shell closed at the bottom and open at the top, and spaced at all sides and at the

bottom from the outer casing to form an outer air space, an air box open at the top and extending down at one side of said inner shell, said inner shell having tubular compartments extending across said inner shell and communicating at one end with said outer air space and at the other end with said air box, outlet means communicating with the lower end of said outer air space, suction means in said outlet means for drawing air from said outer air space, a burner in the lower part of said inner shell, and an outlet flue at the top of the furnace.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 6th day of November 1912.

EDWARD C. KENT.
LLOYD GILES.
GEORGE A. LYSTER.

In presence of—
ARTHUR P. KNIGHT,
MARTHA M. LANGE.