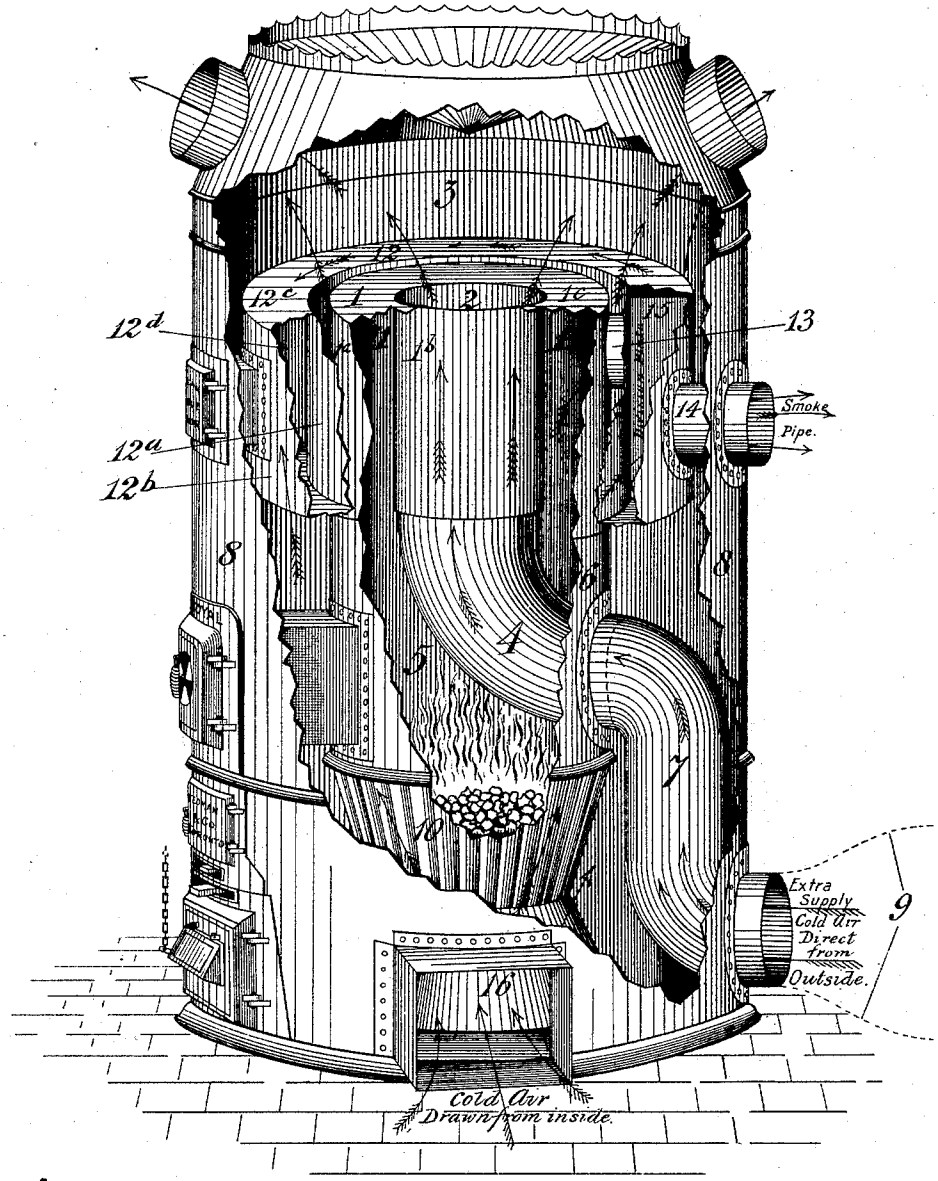
(No Model.)

R. TATE.

HOT AIR FURNACE.

No. 483,819. Patented Oct. 4, 1892.



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HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 483,819, dated October 4, 1892.

Application filed March 26, 1892. Serial No. 426,515. (No model.)

To all whom it may concern:

Be it known that I, ROBERT TATE, manufacturer, of the city of Toronto, county of York, Province of Ontario, Canada, have invented certain new and useful Improvements in Hot-Air Furnaces; and I hereby declare the following to be a full, clear, and exact description of the same.

This invention relates to certain improvements in hot-air furnaces, and more particularly to the method of introducing cold air into the furnace and of heating the same; and the object of the invention is to provide a means for the introduction into the furnace of an auxiliary supply of cold air, conducting the cold air to the distributing-chamber by way of the fire-box and the inner drum, and heating it during its passage therethrough; and the invention consists, essentially, of forming a vertical passage centrally through the inner drum, and connecting to the lower end of this passage the upper end of a curved pipe located within the fire-box and extending through the wall thereof, and connecting to the lower end of this curved pipe a metallic pipe which extends down to the base of the furnace within the furnace-casing and passing therethrough to the outer wall, and connecting to the lower end of this pipe a shaft which extends to the outside of the building. The current of air enters this shaft and passes through to the pipe within the furnace-casing, where it ascends to the curved pipe within the fire-box and passes therethrough and through the vertical passage formed through the inner drum to the distributing-chamber. The air entering the shaft is the same temperature as the air outside of the building. The instant, however, it enters the pipe within the furnace-casing it is heated by heat radiated from the fire-pot and fire-box walls. The air when within the curved pipe within the fire-box is heated by the direct radiation of the heat from the fire, and this air ascending to the vertical passage through the inner drum is again increased in temperature by the radiation of the heat from the products of combustion circulating through the passage between the walls of this drum on their way to the outlet of the chimney, the whole being more fully described in the following specification.

In the drawing the figure is a perspective view of a furnace, the outer casing of which and the casing of the drums, fire-box, and fire-pot are broken away to show the vertical passage centrally through the inner drum, the curved pipe connected to the lower end of the vertical passage and extending to the outer wall of the fire-box, the metallic connection-pipe to the base of the furnace, located within the furnace-casing, the cold-air shaft from the outside of the building, connected to the lower end of the metallic connection-pipe, and the cold-air supply to the heating-chamber of the furnace from the inside of the building.

Like numerals of reference refer to like parts throughout the specification and drawing.

My furnace consists of an inner drum 1, comprised of an outer wall 1^a and an inner wall 1^b, connected at the top by an annular metallic plate 1^c. The inner wall 1^b of the drum 1 composes the casing of the vertical passage-way 2, formed centrally through the inner drum 1. The upper end of the vertical passage 2 opens into the distributing-chamber 3 at the top of the furnace, while to the lower end of the passage is connected the top end of the curved pipe 4, located within the fire-box 5. The lower end of the curved pipe 4 extends beyond the outer wall 6 of the fire-box 5, and to the lower end of the curved pipe 4 is connected the upper end of a metallic connection-pipe 7, located within the furnace-casing 8 and extending to the base of the furnace and beyond the furnace-casing. Connected to the lower end of the metallic connection-pipe 7 is one end of a shaft 9, while the other end of said shaft projects to the outer side of the building, this shaft being shown in dotted lines in the drawing.

As shown by arrows in the drawing, the cold air enters the metallic connection-pipe 7 from the shaft 9 and passes through the pipe 7 to the curved pipe 4, from which it passes to the vertical passage 2 through the inner drum 1, ascending to the distributing-chamber 3, from whence it is carried to its respective destinations in the usual manner. The air when

within the shaft 9 is of the same temperature as the air outside of the building. When, however, it has entered the connection-pipe 7, it is partially heated by means of heat radiated from the walls of the fire-pot 10, and after passing into the curved pipe 4 it is heated by the direct radiation of the heat from the coals within the fire-box 5 and fire-pot 10. It is during its passage through the pipe 4 that the air within the said pipe absorbs the greatest amount of heat. The air passes from the pipe 4 to the vertical passage 2, where it is again increased in temperature by the products of combustion circulating through the chamber 11, formed between the inner wall 1^b and outer wall 1^a. The passage of the air through the pipes 7 and 4 and the vertical passage 2 heats the air to the required temperature before it enters the distributing-chamber 3.

Surrounding the inner drum 1 is an outer drum 12, comprised of an inner wall 12^a and an outer wall 12^b, connected together at their upper and lower ends by means of annular plates 12^c, and formed between these walls is a combustion-chamber 12^d. A connection is made between the combustion-chamber of the inner drum 1 and the combustion-chamber 12^d of the outer drum 12 by means of a short pipe 13. Between the inlet of the pipe 13 into the combustion-chamber 12^d in the outer drum 12 and the outlet 14 to the chimney is a partition 15 to prevent the short-circuiting of the products of combustion from the combustion-chamber 12^d in the inner drum to the outlet to the chimney, this partition forcing the products of combustion to complete a travel of almost the entire circuit of the combustion-chamber 12^d of the outer drum before being allowed to escape. By this means it is possible to absorb a greater percentage of the heat from the products of combustion and utilize the same for heating purposes.

Located at or near the base of the furnace is an opening into the heating-chamber formed between the inner wall of the furnace-casing 8 and the outer walls of the fire-pot, fire-box, and drums. The supply of cold air passes in through the opening 16 to this heating-chamber and is heated by the heat radiated from the walls of the fire-pot, fire-box, and drums and passes to the distributing-chamber 3, where it unites with the air heated during its passage through the curved pipe and vertical passage 2. By a device constructed on this principle it is possible to heat at least thirty-three and a third per cent. more air than could be heated by a furnace of the same size and using the same amount of fuel not provided with a vertical passage through the inner drum and connections. This vertical passage and connections to the outside of the building insure to the rooms of the building heated a constant supply of fresh air direct from the outside and heated to the required temperature. This improvement does not occupy any space that could be otherwise employed; nor does it in any way interfere with the radiation of the heat and the heating of the cold-air supply taken from the outside of the building.

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

1. In a hot-air furnace, the combination of an inner heating-drum suspended within the furnace-casing, a vertical passage-way through the inner heating-drum and located centrally in the same, a distributing-chamber above the heating-drum, into which opens the upper end of the vertical passage-way, the fire-box located below the heating-drum, a pipe within the fire-box, the upper end of which is connected to the lower end of the vertical passage-way and the lower end of said pipe projecting beyond the fire-box wall, a furnace-casing, a cold-air-supply pipe located between the furnace-casing and the outer wall of the fire-box, the upper end of the cold-air-supply pipe connected to the lower and outer end of the pipe within the fire-box, a cold-air-supply shaft connected to the cold-air-supply pipe, and a passage between the furnace-casing and the outer walls of the fire-box and heating-drum, leading to the distributing-chamber, substantially as described.

2. In a hot-air furnace, the combination of the inner heating-drum suspended within the furnace-casing, a vertical passage-way through and located centrally in the drum, a distributing-chamber, the upper end of said passage-way opening into the distributing-chamber and the lower end connected to the top end of a bent pipe located within the fire-box, the other end of said bent pipe projecting beyond the wall of the fire-box, a metallic pipe connected to the outer end of the bent pipe and to the cold-air-supply shaft, said metallic connection-pipe adapted to be heated by the radiation of the heat from the walls of the fire-pot and the bent pipe adapted to be heated by the radiation of the heat from the fire within the fire-box, a cold-air-supply shaft connected to the cold-air-supply pipe entering the heating-chamber between the furnace-casing and the walls of the fire-pot, the fire-box, and the heating-drum, substantially as described.

Toronto, March 15, 1892.

R. TATE.

In presence of—
CHAS. H. RICHES,
M. E. ANGELL.