No. 703,195. Patented June 24, 1902.

E. L. HEALD.

HOT AIR FURNACE.

(Application filed Oct. 11, 1901.)

(No Model.)

Fig. 1.

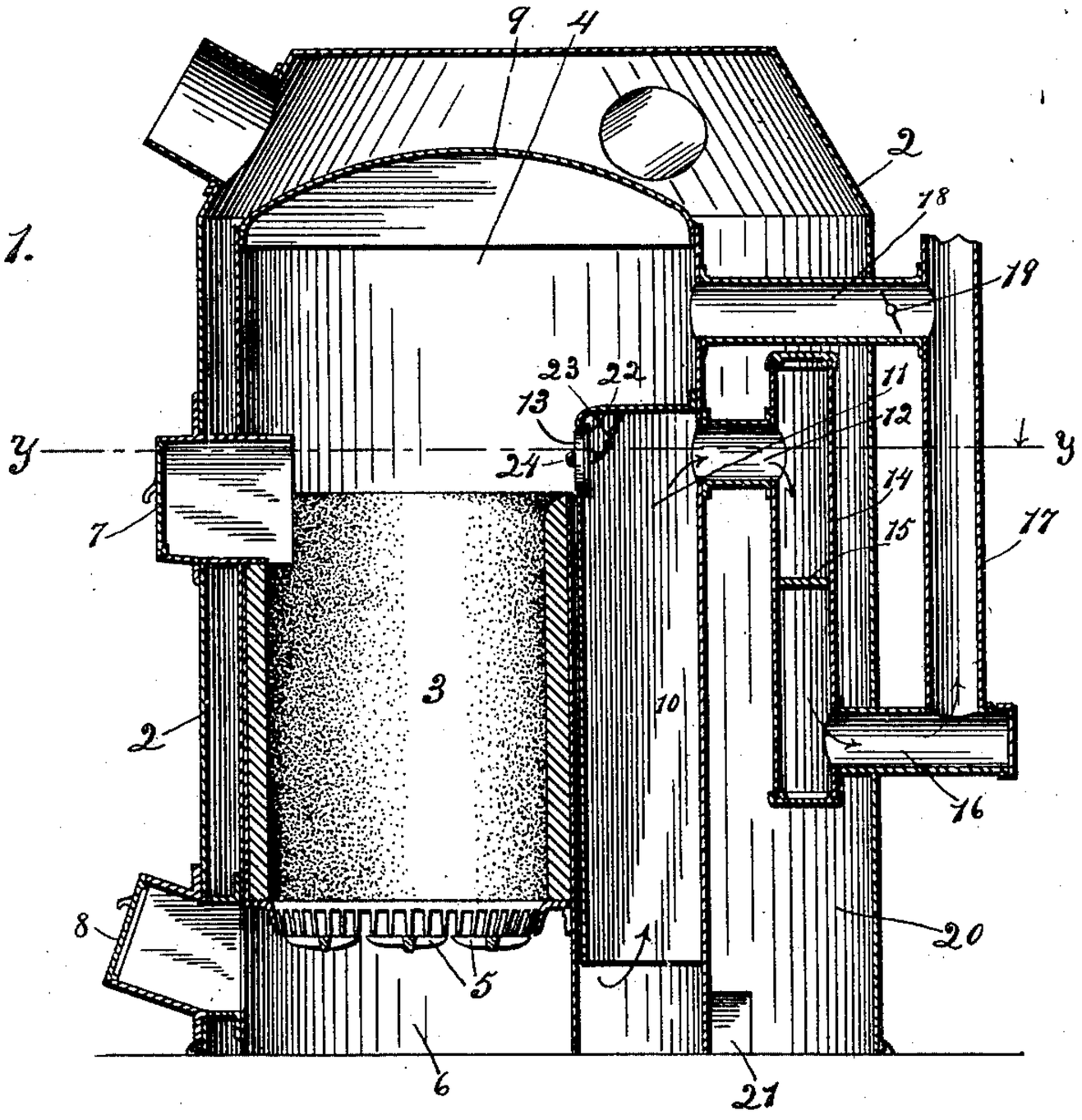
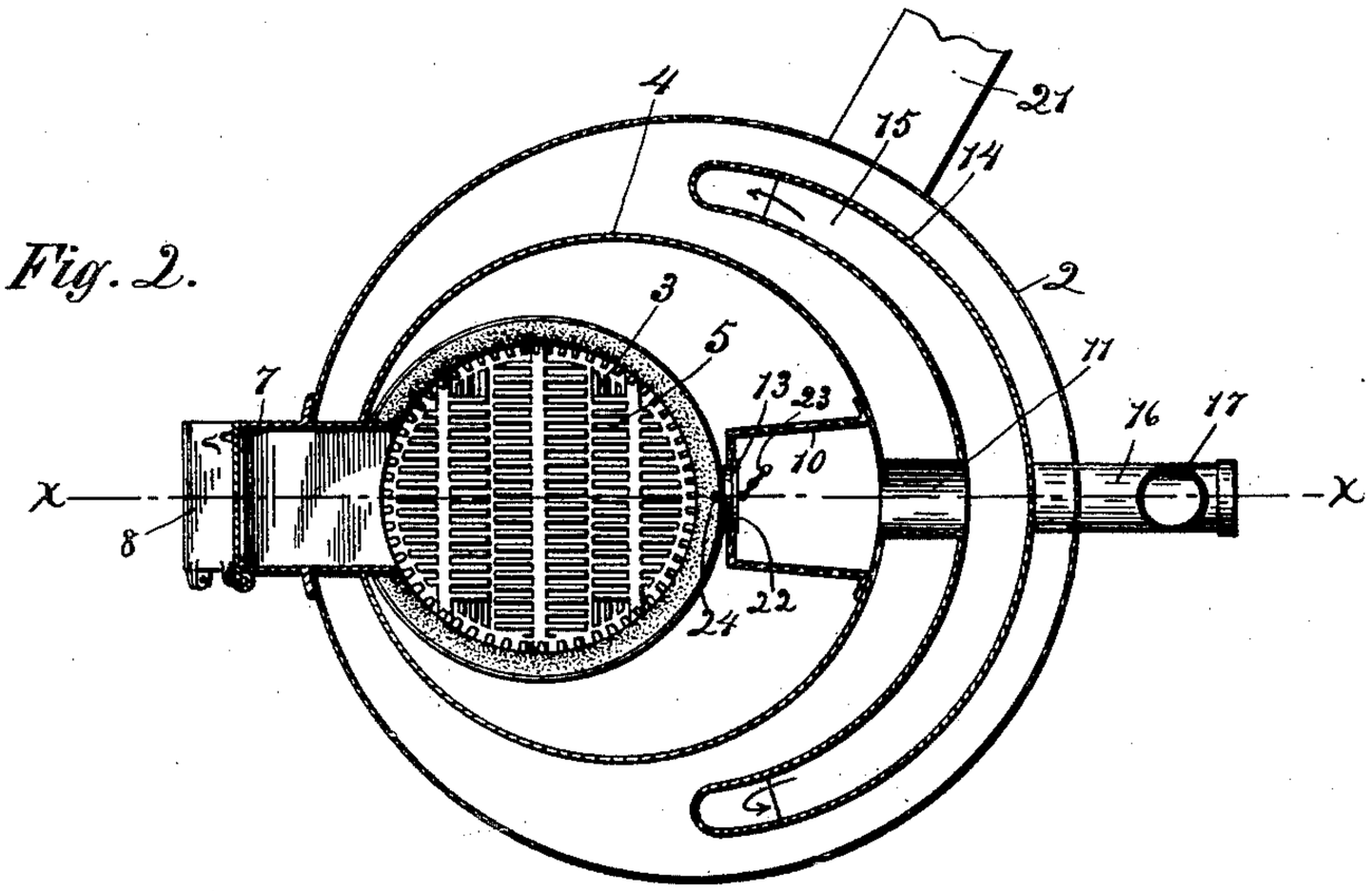


Fig. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 703,195, dated June 24, 1902.

Application filed October 11, 1901. Serial No. 78,291. (No model.)

To all whom it may concern:

Be it known that I, EDWARD L. HEALD, a citizen of the United States, residing at Blue Island, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hot-Air Furnaces, of which the following is a specification.

My invention relates to furnaces designed to heat and distribute currents of air, and has for its primary and particular object the disposition of the hot gases of combustion in such a manner as to prevent their immediate concentration upon some exposed part or parts of the furnace to prematurely burn out the same. In many of the so-called "hot-air" furnaces of common and usual construction the gaseous products of combustion in their heated state are conveyed more or less directly from the top of the fire-box into a horizontal flue leading to the smoke-pipe. The necessary concentration of these hot gases at the interior aperture of said flue overheats the joint or connections between said flue and the casing of the combustion-chamber, usually resulting in an early burning out of the more exposed parts, requiring their too frequent renewal.

Incidental to the above, further objects of my invention are in disposing of the hot gases so as to prevent immediate concentration upon some exposed and unprotected part or parts to present the greatest possible area of radiating-surface to the air in the heating-chamber and to distribute the heat more uniformly over said radiating-surface. As is well known, furnaces of this character are usually provided with a cold-air flue to convey the cold air from outside the building to the bottom of the heating-chamber. Within this chamber the air is heated, rises, and is distributed in its heated state through suitable flues leading from the top of said chamber.

My invention consists generally in means for bringing the hot gases of combustion into immediate proximity to the incoming cold air just prior to their concentration at the orifice of the flue leading to the smoke-pipe. It will be apparent that a double purpose will thus be served—first, the hot gaseous products of combustion coming into contact with that portion of the shell exposed to the current of cold air will give up a large number of heat units and enter the discharge-flue at a much lower temperature, thus lengthening the life of said flue and its connections; secondly, the incoming cold air taking up a large number of heat units from the hot gases at the moment of entering the heating-chamber will more quickly acquire a higher temperature, thereby reducing the combustion subsequently necessary to heat said air to the required degree; and my invention further consists in means for disposing of the hot gases in such a manner that the largest possible area of radiating-surface will be presented to the air in the heating-chamber; and my invention further consists in the various details of construction and in combinations of parts, all as hereinafter described, and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a vertical central section of a furnace embodying my invention on the line *x x* of Fig. 2, and Fig. 2 is a horizontal section of the same substantially on the line *y y* of Fig. 1.

Referring now to the drawings in detail, the numeral 2 refers to the exterior casing of a furnace, 3 to the fire-box, and 4 to the shell which divides the combustion-chamber from the air-chamber, all of which are of substantially usual construction, except that while circular in horizontal section the circles are not concentric, but substantially tangential, being so arranged that both fire-box and shell are brought as near as possible to the front wall of the furnace, leaving the distances between fire-box and shell and between shell and outer casing greatest at the rear of the furnace. The fire-box 3 extends preferably to the base of the furnace, being provided with the grates 5, the ash-pit 6, the fuel-door 7, and the ash-door 8, all of substantially usual construction and location. The shell 4 also

extends to the base of the furnace and is preferably capped with a high rounded dome 9 to provide a large chamber above the fire-box.

Back of the fire-box and within the shell, and preferably contiguous to both, I have shown a vertical and substantially rectangular flue 10, the bottom of which opens directly into the chamber between fire-box and shell in furnaces of ordinary size from six to eight inches from the base of the chamber. This flue 10 is otherwise closed to the heating-chamber, but is provided with a rear lateral aperture 11, leading into a short horizontal flue 12, opposite which in the front wall of said vertical flue 10 is the vent 13, slightly above the top of the fire-box.

The short horizontal flue 12 leads into the top of a U-shaped radiator 14, located in the air-chamber opposite the doors or openings to the furnace and extending through an arc of approximately one hundred and eighty degrees. A baffle-plate 15 divides the radiator 14 horizontally into two compartments, open to each other at each end of said baffle-plate, causing the gases of combustion to pass through its entire interior in reaching the short horizontal flue 16, leading from the bottom of said radiator directly into the smoke-pipe 17. Another horizontal flue 18 connects the up portion of the shell 4 directly with the smoke-pipe 17, the purpose of which is to create a stronger draft in starting the fire, a suitable damper 19, preferably operated from the front of the furnace, shutting off this flue when the fire is started, forcing the gases downward around the wall of the fire-box and through the vertical flue 10.

The combustion-chamber is large, and as the gaseous products of combustion escape from the fire-box they first come in contact with the dome or upper portions of the heating-surface and then pass downward into the narrow space between the fire-box and the vertical heating plate or shell to the base of the furnace. As the cold air enters the air-warming chamber 20 through the cold-air flue 21 at the bottom of the casing it first comes in contact with the lower portion of the heating-plate, thus immediately taking up heat from that portion of the shell reached directly by the hot gases before they enter the flue, conveying them directly or indirectly to the smoke-pipe. Thus, the fire having spent a part of its force, the cooler gases having settled to the bottom of the furnace, and considerable heat having been given up to the incoming cold air, the rapid burning out of the more exposed interior parts is absolutely prevented and the life of the furnace materially lengthened. A natural law is thus utilized to protect the opening or shoulder and at the same time to make available the entire length of the shell as a heating-surface. Furthermore, as the cold air enters the heating-chamber it first comes in contact with the casing of the combustion-chamber at the point where the hot gases of combustion enter the vertical flue 10, and is consequently more quickly heated to the desired degree.

I have shown the vent 13 provided with a cap or lid 22, designed to be retained normally in place by its own weight, but easily dislodged and thrown back by the force of expanding gases in case of a slight explosion, as sometimes occurs when bituminous coal is used, thus providing a more direct outlet for these gases. I prefer to employ a short chain 23 to prevent the cap 22 from dropping to the bottom of the furnace when dislodged, while the hook or staple 24 permits of the replacing of the cap by means of an ordinary hook poker through the door.

Many modifications of the minor details of my improved furnace will doubtless readily suggest themselves to those skilled in the art to which it appertains, and I therefore do not desire to limit my invention to the specific construction herein shown and described.

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

1. In a hot-air furnace, the combination with the heating-shell, outer casing and a cold-air flue communicating with the heating-chamber between said shell and casing, the aperture to which flue is in the base of said casing, of a fire-box so disposed within said heating-shell as to provide an annular chamber between said fire-box and shell, and means for concentrating the hot gaseous products of combustion at a point within said annular chamber substantially opposite the aperture of said cold-air flue.

2. In a hot-air furnace, the combination with the heating-shell, outer casing and a cold-air flue having its induction-aperture in the base of said casing, of a fire-box so disposed within said heating-shell as to provide a chamber between said fire-box and shell, and means for causing the flow of hot gaseous products of combustion downward through said chamber and their concentration at a point within the heating-shell substantially opposite the aperture of said cold-air flue.

3. In a hot-air furnace, the combination with the heating-shell, outer casing and a cold-air flue having its induction-aperture in the base of said casing, of a fire-box so disposed within said heating-shell as to provide a chamber between said fire-box and shell, and means for causing a comparatively uniformly distributed flow of the hot gaseous products of combustion over the top of said fire-box and down through said chamber prior to their concentration for final discharge at a point at the base of said chamber and within the heating-shell substantially opposite the aperture of said cold-air flue.

4. In a hot-air furnace, the combination with the heating-shell, outer casing and a cold-air

flue having its induction-aperture in the base of said casing, of a fire-box so disposed within the heating-shell as to provide a chamber between said fire-box and said shell, of a vertical flue within said chamber having its inlet-aperture near the base of said chamber and the top of which communicates with the smoke-pipe, thereby necessitating a comparatively uniformly distributed downward flow of the hot gaseous products of combustion through said chamber prior to concentration at the aperture of said vertical flue.

5. In a hot-air furnace, the combination with the heating-shell, outer casing and a cold-air flue having its induction-aperture in the base of said casing, of a fire-box so disposed within the heating-shell as to provide a chamber between said fire-box and shell, of a vertical flue within said chamber having its inlet-aperture near the base of said chamber and substantially opposite the induction-aperture of said cold-air flue, and the top of which vertical flue communicates with the smoke-pipe, thereby necessitating a comparatively uniformly distributed downward flow of the hot gaseous products of combustion through said chamber prior to their concentration at the aperture of said vertical flue.

6. In a hot-air furnace, the combination with the heating-shell, outer casing and a cold-air flue having its induction-aperture in the base of said casing, of a fire-box so disposed within the heating-shell as to provide a chamber between said fire-box and shell, of a vertical flue within said chamber having its inlet-aperture near the base of said chamber and substantially opposite the induction-aperture of said cold-air flue, a substantially U-shaped radiator between said shell and casing, means for conveying said gaseous products from the top of said vertical flue to the top of said radiator, and means for conveying said gases from the bottom of said radiator to the smoke-pipe.

7. In a hot-air furnace, the combination with the heating-shell, outer casing and a cold-air flue having its induction-aperture in the base of said casing, of a fire-box so disposed within the heating-shell as to provide a chamber between said fire-box and shell, of a vertical flue within said chamber having its inlet-aperture near the base of said chamber and substantially opposite the induction-aperture of said cold-air flue, a substantially U-shaped radiator between said shell and casing, a suitable flue connecting the top of said vertical flue with the top of said radiator and a flue connecting the bottom of said radiator with the smoke-pipe.

8. In a hot-air furnace, the combination with the heating-shell, outer casing and a cold-air flue having its induction-aperture in the base of said casing, of a fire-box so disposed within the heating-shell as to provide a chamber between said fire-box and shell, a vertical flue within said chamber having its inlet-aperture near the base of said chamber and substantially opposite the induction-aperture of said cold-air flue, a substantially U-shaped radiator between said shell and casing, said radiator being divided horizontally by a baffle-plate into two connecting compartments, a suitable flue connecting the top of said vertical flue with the upper compartment of said radiator, and a flue connecting the lower compartment of said radiator with the smoke-pipe.

In testimony of the foregoing I have hereunto set my hand, this 3d day of October, 1901, in the presence of two subscribing witnesses.

EDWARD L. HEALD.

Witnesses:
A. H. SYMONS,
A. B. SPRAGUE.