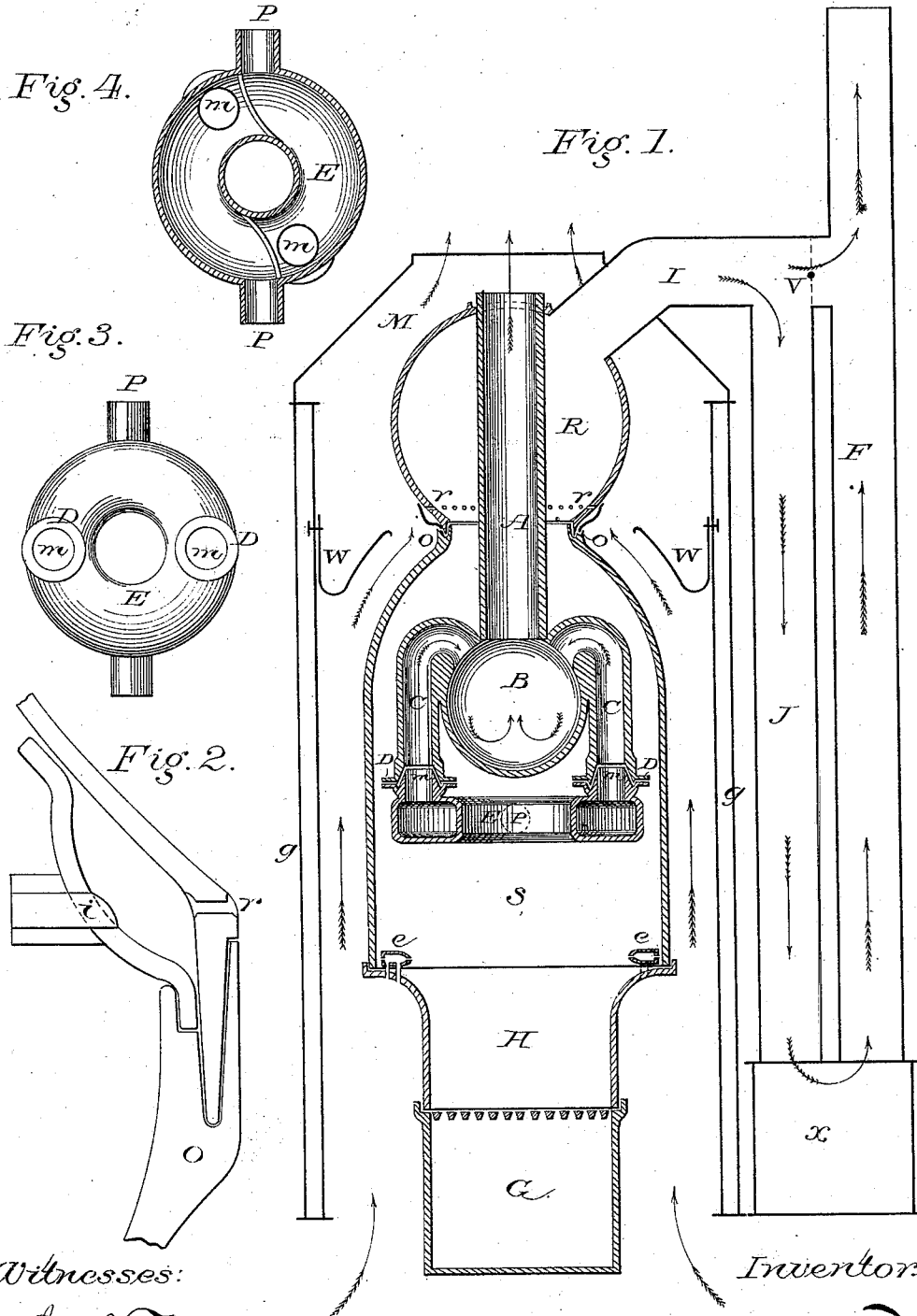


D. P. KAYNER.
Double-Combustion Hot-Air Furnace.

No. 218,982.

Patented Aug. 26, 1879.



Witnesses:

Geo J. Fourn
H. W. Parker

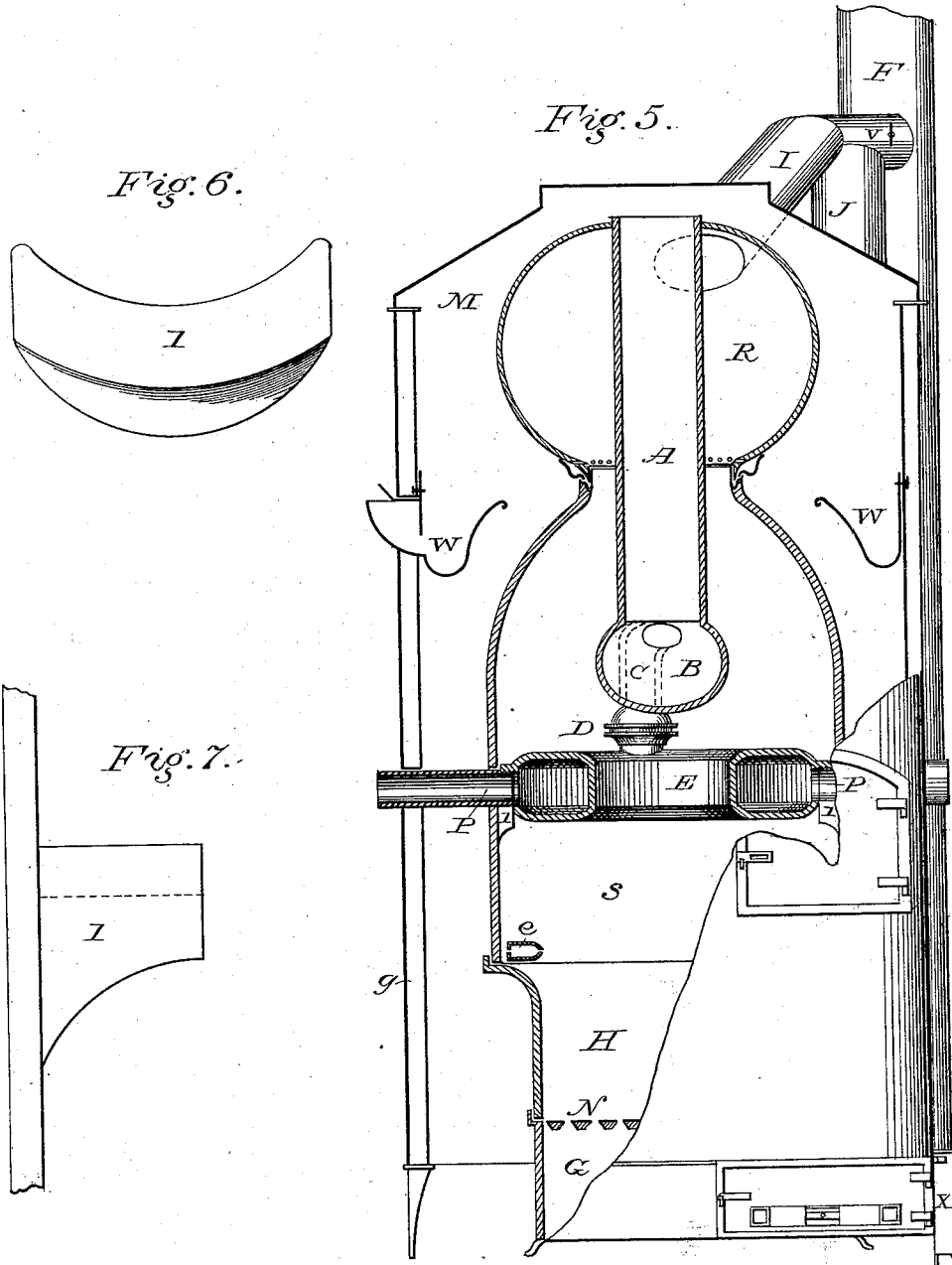
Inventor

David P. Kayner

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Witnesses:
James C. Baird
J. S. Van Ratten

Inventor:
David P. Kayner.

UNITED STATES PATENT OFFICE.

DAVID P. KAYNER, OF ST. CHARLES, ILLINOIS.

IMPROVEMENT IN DOUBLE COMBUSTION HOT-AIR FURNACES.

Specification forming part of Letters Patent No. **218,982**, dated August 26, 1879; application filed February 9, 1871.

To all whom it may concern:

Be it known that I, DAVID P. KAYNER, of the city of St. Charles, county of Kane, and State of Illinois, have invented certain Improvements in Hot-Air Furnaces, of which the following is a specification.

My invention consists in a hot-air furnace having, in connection with the external surface-radiation, an interior hollow apparatus, to which air is admitted and heated within the combustion-chamber in the direct heat of the fire-pot, and in the various parts of the same, to be hereinafter described.

Figure 1 is a vertical section of the furnace, showing its interior structure and arrangements. Fig. 2 shows the manner of making the joints to prevent any admixture of gas from the combustion-chambers with the heated air, and also shows the ring-collar, which forms the air-chamber or gas-ring, to permit the introduction of heated air into the bottom of the second combustion-chamber, to complete in the same the combustion of the unconsumed gases evolved from the fire below. Figs. 3 and 4 represent the hollow ring, with the different ways of constructing the same—singly, with opposite openings, as at Fig. 3, or chambered, as shown in an inverted horizontal section at Fig. 4. Fig. 5 is a vertical central section from side to side. Fig. 6 is an end view, and Fig. 7 is a side view, on an enlarged scale, of the brackets which support the ring.

The combustion-chamber proper (marked S) is an extended cylinder contracted in an arc of a circle at its top, where a socket is formed to receive the downward lap of the second combustion-chamber, and also the lower edge of the gas-ring. On the inside are opposite brackets, on which the branch pipes P P of the ring rest, to support in place the ring and sphere.

The sphere is a hollow globe with the three openings—the pipes C C and A—and, when coupled with the hollow ring and in their place within the combustion-chamber, form the internal air-heating apparatus.

The second combustion-chamber is a hollow sphere also, with three principal openings—the bottom one connecting with the combustion-chamber proper, the top one for the pass-

age of the pipe A, and the lateral one at the top for the smoke-flue.

The fire-pot rises perpendicularly from the ash-pit, and at the top is enlarged on a quarter-circle, to receive the bottom of the combustion-chamber proper within a flange rising from its outer edge. It also forms a support outside of the direct line of the fire for the first or internal gas-ring.

The construction of the furnace is simple, consisting of a plain chambered heating apparatus containing within it a hollow ring and sphere, or either of them, communicating with the outer air through the casing and walls of the furnace, and opening out at the top of the same, to discharge the air passing through and heated within them, the whole inclosed in a casing of brick, or in a double metallic casing resting on perforated rings separate from or connected with the furnace.

Resting on the ash-pit G, which supports the grate N, I place the fire-pot H, on the top of which, in a sink for that purpose, rests the bottom of the combustion-chamber S, upon the top of which is placed the second combustion-chamber, R, and the two are united by the double lap and socket joint, with an inner upward and an outer downward lap, the inner one the longest, as shown at *o o*, Fig. 1, and *o*, Fig. 2.

From the upper side of the spherical combustion-chamber, at an angle to the vertical line of the furnace, as shown in the accompanying drawings, the smoke-flue I extends upwardly and outwardly, and by the valve V the smoke can be changed from the direct flue F to the drop-flue J, thereby increasing or diminishing the draft, as necessity may require.

The doorway for supplying the furnace with fuel is attached to and opens into the main combustion-chamber by a box-flange, which extends through the outer shell of the furnace, opening into it just below the bottom of the hollow ring.

The ring and sphere are made hollow, with the branch and connecting pipes shown in the accompanying drawings, and are supported within the combustion-chamber upon opposite brackets inside the same, as shown at *l l*, Fig. 5, and at *t*, Fig. 7. On these brackets

the branch pipes P P of the ring rest; and through proper openings above the brackets closely-fitting pipes, passing through the outer shell of the furnace and sides of the combustion-chamber, are screwed into or fastened to the horizontal branch pipes P P of the ring E, for conveying cold air to the interior of the ring, as represented at dotted P, Fig. 5, and also at P P, Fig. 5.

The pipe A rises perpendicularly from the hollow sphere B, up through the neck of the combustion-chamber, and through an opening on the top of second combustion-chamber, where it is luted to form a gas-tight joint by means of a rim or shoulder on the pipe A within the spherical chamber, and a collar or rim projecting from the top of the chamber, forming a sink around the pipe to hold the cement in place, or by means of a wrought-iron ring shrunk onto the top of the pipe A close down upon the spherical chamber. By this pipe the air, passing through and heated in the ring and sphere, is conveyed to the hot-air chamber M, to the register, or directly into the room.

The ring E and sphere B are hollow, and are connected through the pipes C C by a double lap and socket joint, the same as used at *o o*, Fig. 1, and *o*, Fig. 2, with the addition of the flanges D D for bolting them together. The inner upward lap is shown at *m m*, Fig. 1, in the perpendicular branch pipes of the ring.

On the outer edge of the joint, at the top of the extended combustion-chamber, is a projecting lip, forming a circular groove or sink around the joint. Into this sink the bottom projection of the ring-collar *i* is cemented, while its upper surface is fitted to form a joint with the outside of the second combustion-chamber when adjusted in place, or may be held by a groove cast in the under edge of the chamber for that purpose. This ring-collar is curved outwardly in the center to form an air-chamber around the joint, and, by pipes fitted into it for that purpose, air is admitted to and heated in its interior, which, passing through the perforations shown at *r r*, Fig. 1, and *r*, Fig. 2, into the bottom of the second combustion-chamber, R, completes therein the combustion of the unconsumed gases generated in the fire below, by producing a second and complete combustion thereof before cooling, and condensation takes place, the same as the gases in the cupola of a furnace are ignited, by opening the door above the charge after the fire is blown up, thereby preventing the formation of soot and lessening the density of the smoke, at the same time increasing the heat of the furnace.

Within the outer casing, at a point opposite the circular contraction near the top of the

combustion-chamber, is the circular water-pan W W, entirely encircling the combustion-chamber, with a feed-spout extending through the casing, and having its inner rim curved, so as to deflect the air toward the joint *o*, as shown in the accompanying drawings.

The drop-flue J and the main flue F rest upon the box X, through which they can be easily cleaned without removal.

The arrows within the casing and within the ring and sphere show the direction of the currents of air while being heated. Those in the flues mark the course of the smoke in the drop-flue or in the direct draft, according as the valve V is open or closed.

The double metallic casing inclosing the furnace proper is shown by the outer parallel lines *g g*, Fig. 1, in the accompanying drawings.

The combustion-chamber S is an extended cylinder, with a circular contraction at its top to form its neck or flue at the point of uniting with the second combustion-chamber, R, having a doorway, inside brackets for supporting the internal air-heating apparatus, and openings above them for pipes to the horizontal pipes P P of the ring E for the admission of air. It rests upon the fire-pot H. The fire-pot is hereinbefore fully described.

The ash-pit G is, like the bottom of the fire-pot, perpendicular, with an enlarged flange at the top to form a sink to support the fire-pot; also with rests for the grate, and a doorway, with slides, for regulating the draft of the furnace.

The pipes for conveying air to the interior of the ring-collar *i*, which surrounds the joint *o*, may be extended within the casing to near the floor, by which means a hot-air blast is introduced into the neck of the chamber R from the air becoming heated before it reaches that point, thereby promoting a second and complete combustion of the heated carbon vapors within the chamber, and preventing the formation of soot.

I claim as my invention—

1. The arrangement, in a hot-air furnace, of the chambers S and R, the hollow ring E, the sphere B, their pipes P P, C C, and A, the gas-rings *e* and *i*, and the fire-pot H, as and for the purposes hereinbefore specified.

2. The combination, in a hot-air furnace, of the double lap and socket joint, as shown at *o o* and *o*, Figs. 1 and 2, having an inner upward and an outer downward lap, and the ring-collar *i*, or its equivalent, which surrounds the joint *o*, for the purposes hereinbefore specified.

DAVID P. KAYNER.

Witnesses:

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H. W. PARKER.