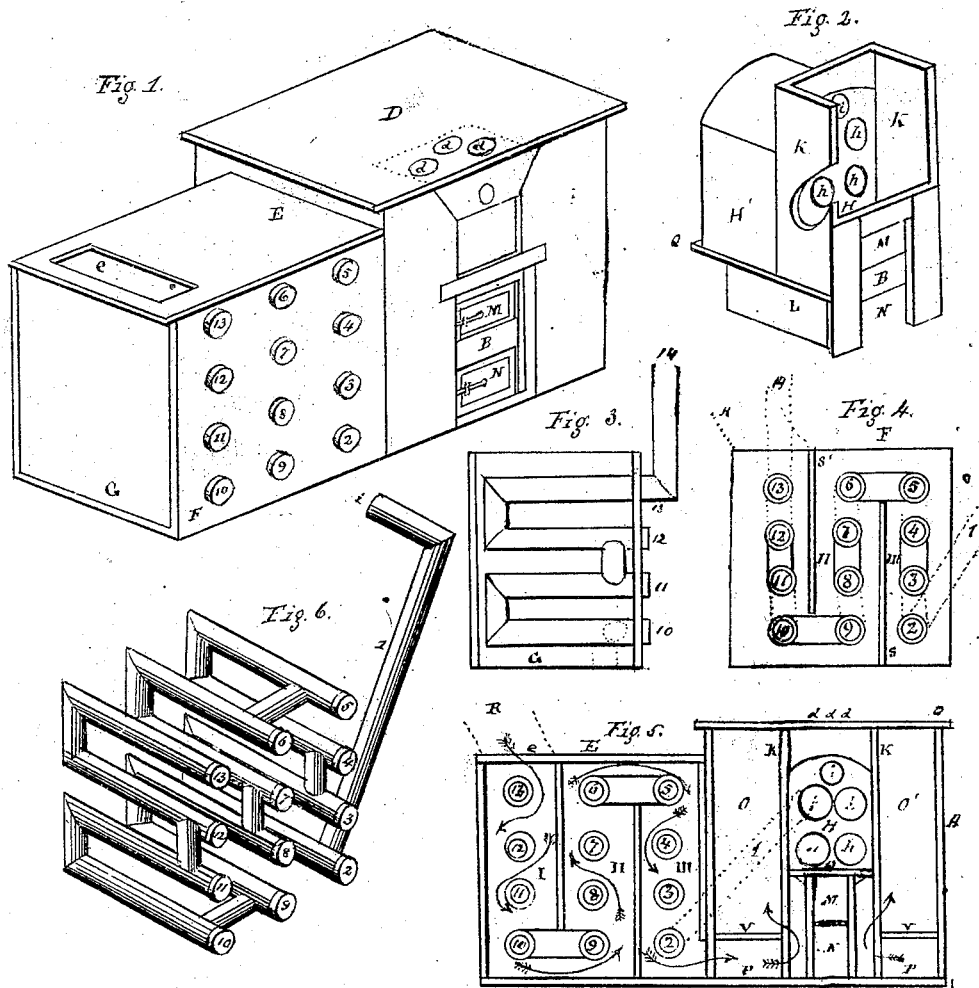


Sheet 1.

EDWIN CLARK'S
Improvement in Hot-Air Furnaces.

114528

PATENTED MAY 9 1871



Witnesses.

W. B. Wiley
Jacob Stauffer.

Inventor.

Edwin Clark.

Additional Drawings:-

in Improvement in Hot air Furnaces.

Fig. 7.

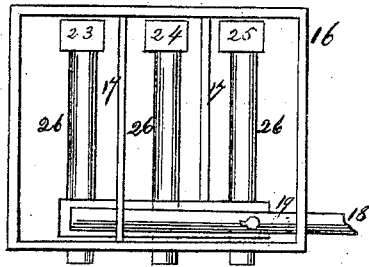


Fig. 8.

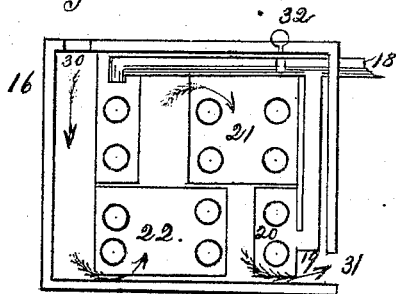
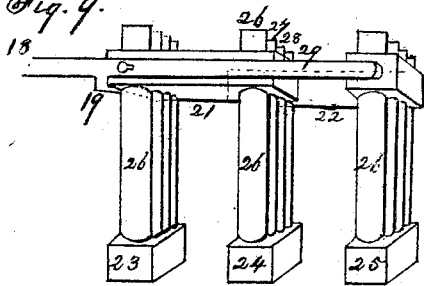


Fig. 9.



Inventor

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Witnesses -

Max Plan Peigart

Edw. F. Brown

United States Patent Office.

EDWIN CLARK, OF LANCASTER, PENNSYLVANIA.

Letters Patent No. 114,528, dated May 9, 1871.

IMPROVEMENT IN HOT-AIR FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

I, EDWIN CLARK, of Lancaster, in the county of Lancaster and State of Pennsylvania, have invented certain Improvements for Utilizing Waste Heat, and in the Construction or Arrangement of Hot-Air Furnaces for Heating Dwellings, &c., of which the following is a specification.

The primary object of my invention is to utilize the heat of the product of combustion usually allowed to escape through the smoke-flue into the chimney, which is considerable, and a great waste. One mode to accomplish this is by means of a chambered cold-air flue or casing, causing the air to rise and fall and come in contact with a large surface of the smoke-flue arranged in three or more series horizontally crossing each chamber—say, four times—and so as to deliver the air thus warmed against the fire-box and around three sides of the furnace, constituting a hot-air chamber, from which the air is drawn through the furnace to a second hot-air chamber, from whence it is conveyed in the ordinary manner.

The drawing illustrates this arrangement, in which—

Figure 1 is a perspective plan view of the several parts employed.

Figure 2, the furnace detached, the outer wall or face removed to show the sides K forming the second or final hot-air chamber over the fire-box M.

Figure 3, a vertical section of the last tier of smoke-flues in chamber I.

Figure 4 shows the capped projecting ends of the three series of flues, numbered from 2 to 13, within the several cold-air chambers.

Figure 5 shows a section of the inner arrangement of the cold-air chambers and hot-air chambers, furnace, and flues.

Figure 6 is a perspective view of the three series of smoke-flues shown detached from the several chambers and furnace.

Figure 7 represents a top view of the pipes and cold-air flues.

Figure 8 is a front view of the same.

Figure 9 is a perspective view of the same, exhibiting the pipes and flues as connected together.

The same numbers and letters refer to the same thing in the drawing.

A brief explanation will enable any one skilled in the art to make and use my invention.

The sides and top, constituting the cold-air flues, marked E G F, made of casting or other material, have a partition, *s'*, from the top to near the bottom, and a second partition, *s*, from the bottom to near the top, dividing this trunk into three chambers, I II III.

The cold air enters through *e* into the first chamber, and circulates around the smoke-flues to the bot-

tom opening under partition *s'*; thence up around the flues in this chamber over the top flue and partition *s* down the third chamber, in like manner, to the bottom, where it enters under the floor *r*, surrounding the fire-box and furnace with an open space, leading the already-warmed air against the fire-box and up three sides of the furnace *o o'*, being an outer hot-air chamber, from whence it is conducted through the furnace, in horizontal flues *h*, into the second hot-air chamber over the fire-box in front of the furnace closed by the sides K and front A, either of metal or brick-work, from the top of which second hot-air chamber it passes through openings *d d* into one or more pipes or flues to convey the heated air to the place of designation in the ordinary manner.

The products of combustion pass out from the arched top at *i* into the smoke-pipe marked 1, and are carried down inside the outer wall or plate to the lower pipe or flue marked 2 in chamber III of the cold-air conductor, in which flue it is carried back and up vertically into No. 3; coming forward, rising vertically into No. 4, goes back again; rises into No. 5, the top flue, from whence it crosses horizontally in front, over the top of the partition *s*, into the upper flue, No. 6; descending from flue to flue to No. 9, the lower flue in chamber II, when it crosses horizontally below the partition *s'* into the lower flue, No. 10, in the first chamber; and rising from flue to flue until it reaches No. 13, from whence it is conveyed into the chimney or flue of the dwelling deprived of all its heat from the action of the cold air in its winding passage through the several chambers.

These flues have each an open end projecting to the outside of the front plate or wall, where they are provided with a cap. These caps can be removed, and the flues are readily cleaned from soot or coal-dust.

This arrangement of the smoke-flues presents a large amount of surface in a small space to the action of the cold air before it reaches the furnace or its immediate surroundings, and utilizes the heat otherwise lost.

Figs. 7, 8, and 9 show how I may vary the connections of the pipes and flues without changing the principle of my invention.

16 shows the sides of the cold-air chamber.

17 represents the partitions of the cold-air chamber.

18 shows how the direct flue from the furnace may be connected at the top and extend direct into a small air-chamber leading into the chimney instead of in an incline.

19 shows the connecting-pipe from pipe 18, extending down into the side of one of the smaller gas-chambers 20.

There are two oblong gas-chambers, 21 and 22, one at top and the other at the bottom, and three smaller gas-chambers, 23, 24, and 25, extending down nearly the depth of the cold-air chamber, each of them having four connecting-flues, 26, 27, 28, and 29.

The cold air passes into the opening 30, down the first chamber under the flues and under the first partition, into the second or middle chamber; thence up and over the flues and over the second partition; thence down the third air-chamber and around the flues, and passing out at the lower opening 31 to the furnace, as indicated by the arrows at fig. 8.

I intend also to use a damper in the direct-pipe 18 for the purpose of cutting off the direct draught and directing it downward through the pipe 19, and thence through the pipes and flues for the purpose of heating the cold air as it passes through the cold-air chambers on its passage around the flues to the opening 31.

I am aware that the products of combustion are deflected from an arched top to either side and made to pass between different layers of cold-air pipes (and the heat of the furnace, more or less) until they pass out from the bottom, in which a series of air-tubes above the fire-chamber is claimed in combination with a hot-air chamber when placed in front of the fire-chamber; as also an arched series of tubes above the fire, and a smoke-flue, when both sides of the same within the furnace are made entirely or chiefly of series of air-tubes. Such an arrangement I disclaim.

I am not aware that the smoke-flues or pipes were ever so arranged within a series of cold-air chambers as to utilize the otherwise-wasted heat effectually out-

side of the furnace or its inclosures properly; neither do I know of any arrangement of a furnace in which the previously-warmed air is passed into a hot-air chamber, then through the furnace into a second hot-air chamber, arranged and constructed as herein shown.

I claim—

1. Utilizing the heated production of combustion in its passage from the furnace at *i*, through a pipe or flue 1, to an outside arrangement of flues and chambers, in which the cold air becomes heated in its passage to the furnace, substantially in the manner specified.

2. A threefold series of flues, No. 2 to 13, as shown, in combination with the chambers I II III and partitions *s s* in the cold-air conductor E F G, arranged in the manner and for the purpose specified.

3. In combination with the series of flues within the cold-air-conducting chambers, the arrangement of flue 1, at *i*, within the hot-air chamber in front of the furnace H, and the sides K, and open bottom *v*, all arranged and operating substantially as and for the purpose described.

4. The arrangement of a furnace having a hot-air chamber, *o o'*, from whence the heated air is passed directly through the furnace into a second hot-air chamber, by the front, top, and sides K K, over the fire-box, from whence it is conveyed in the usual manner, as shown and described.

EDWIN CLARK.

Witnesses:

W. B. WILEY,
JACOB STAUFFER.