

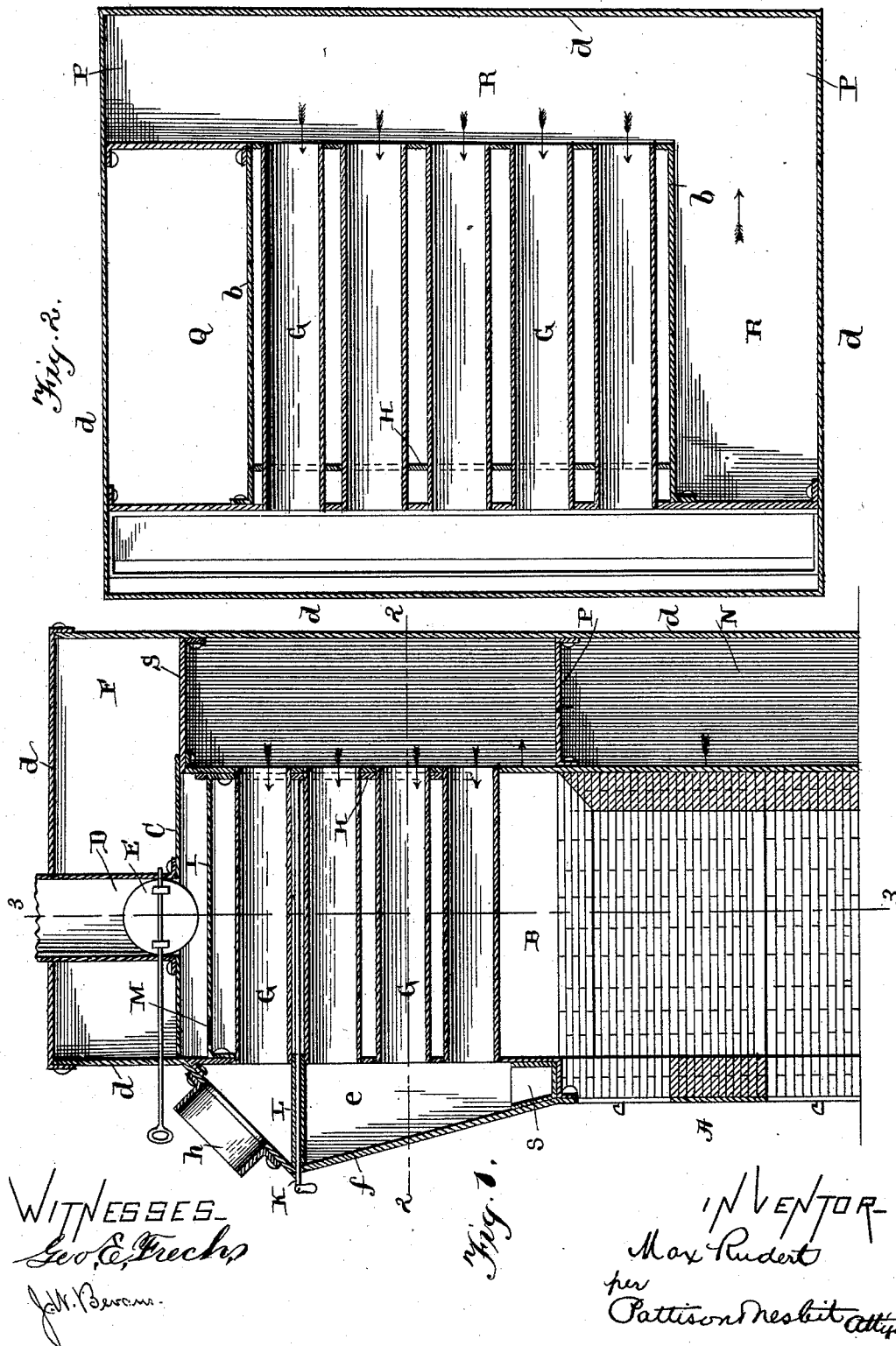
(No Model.)

2 Sheets—Sheet 1.

M. RUDERT.  
HOT AIR FURNACE.

No. 524,653.

Patented Aug. 14, 1894.



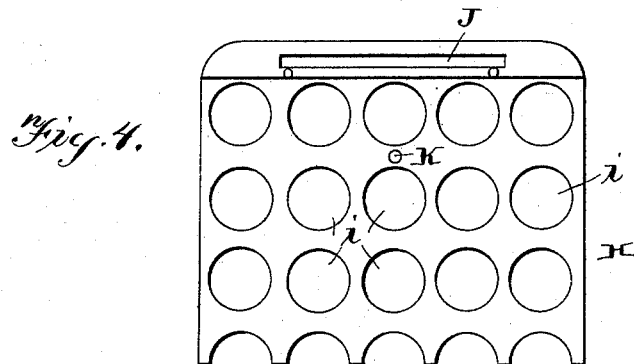
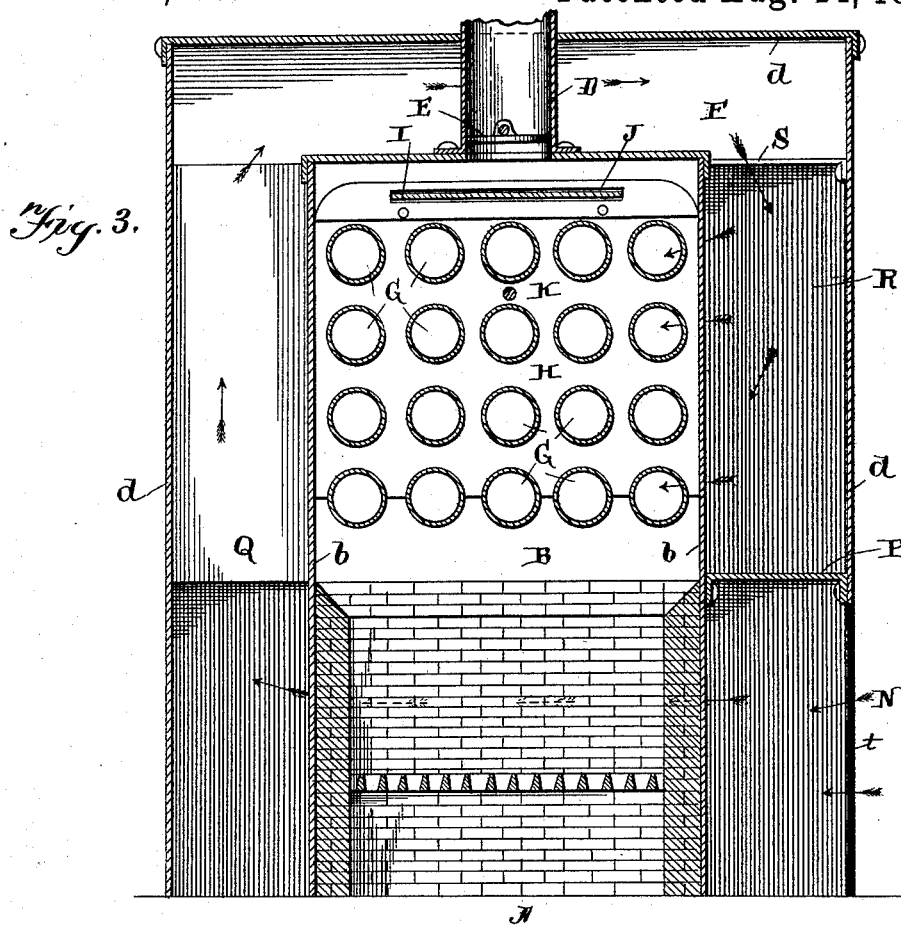
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WITNESSES-  
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per  
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# UNITED STATES PATENT OFFICE.

MAX RUDERT, OF DUQUESNE, PENNSYLVANIA.

## HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 524,653, dated August 14, 1894.

Application filed April 12, 1894. Serial No. 507,334. (No model.)

*To all whom it may concern:*

Be it known that I, MAX RUDERT, of Duquesne, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Hot-Air Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to improvements in hot air furnaces, and it consists in the construction and arrangement of parts which will be fully described hereinafter and particularly referred to in the claims.

The object of my invention is to construct a furnace of the construction hereinafter shown and described whereby the fire box and combustion chamber are entirely surrounded by an air space through which the air passes before receiving its final heating, whereby the top and sides and especially the top are kept so cool that they will not burn anything against them, and which construction serves to give the cold air an initial heating before subjected to final high degree of heat.

In the accompanying drawings:—Figure 1 is a vertical longitudinal sectional view of a furnace which embodies the invention complete. Fig. 2 is a horizontal sectional view taken on the dotted line 2—2 of Fig. 1. Fig. 3 is a vertical sectional view taken on the dotted line 3—3 of Fig. 1. Fig. 4 is a detached view of the cleaner.

Referring now to the drawings, A indicates a fire box of any desired construction and B the combustion chamber directly above the same. A top C is provided for this combustion chamber, arising from the center of which is a pipe or flue D through which the smoke and products of combustion pass to the outside of the building.

A series of tubes or flues G are placed horizontally within the combustion chamber, but have no communication therewith whatever, as will be more fully explained farther on. There may be any desired number of these tubes or flues in each horizontal series, and the flues or tubes of any desired size according to the size and desired capacity of the ap-

paratus. The tubes of each horizontal series however are placed directly above the tubes in the series below, because I find that the upper series are more uniformly heated than is the case where the tubes are placed staggering. It will thus be seen that the heat and flames from the fire pot pass around and through these tubes heating them to a very high degree. Placed around this fire box and combustion chamber is an outer wall or casing, forming a space between the fire box, the walls *b*, of the combustion chamber, and between the top of the casing and the combustion chamber, this space being divided into several passages or chambers as will be fully described presently.

Referring now to Fig. 2 in particular, P is a horizontal division plate which extends around one side of and also the back of the outer casing and between it and the top of the fire box, and about at the top of the fire box as shown in Figs. 1 and 3. This forms an L-shaped inlet chamber N for the inflowing air to be heated which air passes into the chamber through an opening *t*, either at the side or front of the fire box, into the vertical chamber Q, up this chamber into the horizontal chamber F at the top of the combustion chamber, over the combustion chamber, down into the vertical chamber R, as indicated by arrows. This chamber R is L-shaped in horizontal section as shown in Fig. 2, and one end of the hot air tubes G communicate with the said chamber, and the other ends of said tubes with the chamber *e*, at the front of the furnace. The air after receiving an initial heating by passing around the fire box and combustion chamber, over the latter and around to the rear side thereof, passes through the tubes and is highly heated, passing immediately into the outlet chamber *e*, and through the distributing pipes *h*, for conveying it to the different parts of the building. The air in passing around the combustion chamber keeps the top and sides of the outer casing *d*, too cool to cause combustion of anything touching it, and concentrates the heat within the combustion chamber for heating the hot air tubes G. I find that by this arrangement matches can be left upon the top of the casing *d*, and the hottest fire will not ignite them.

Placed within the flue D, is a damper E by means of which the fire can be regulated, and the heat retained within the combustion chamber, as is well understood.

5 It is found that an accumulation of soot and ashes upon the tubes is very rapid, and it becomes necessary to clean them often in order to insure the easy heating thereof at the expense of a small amount of fuel. I  
10 provide for the cleaning of these tubes by means of a cleaner H consisting of a plate with a series of transverse openings  $\frac{1}{2}$ , as shown in Fig. 4, which receive the tubes. This plate is placed within the combustion  
15 chamber with the tubes G passing through the said openings as shown in Fig. 1 and is normally kept at the rear end of the combustion chamber as also shown in Fig. 1. A handle K is attached to this cleaner, and extends  
20 outside of the front of the furnace as shown, by means of which the said cleaner can be drawn outward at any desired time, thus cleaning all the soot and ashes from the tubes which fall into the fire pot.

25 A tube L extends from the wall of the combustion chamber to the outside of the wall  $f$ , of the outlet air chamber  $e$ , through which the handle K passes, so that all possibility of the passage of smoke, or gases from the combustion chamber into the air chamber  $e$  is  
30 avoided.

A flame spreading plate I is placed over a portion of the tubes G, and the cleaner has a horizontal opening J through which the said  
35 plate passes, and the plate I has an opening M at its front end so that the soot and ashes drawn forward thereon fall through the opening downward into the fire pot.

40 While I here show the outer casing of metal, I do not limit myself to this, for it may be formed of brick, or other material, and the dimensions and shape or contour of the furnace changed to suit any particular building, without departing from the spirit of my in-  
45 vention, so long as the internal arrangement remains the same.

I am aware that it is old to pass air around a fire box and through flues or tubes to be heated, and I make no claim to this, my in-  
50 vention relating to my particular construction whereby the air passes around the fire box, over the combustion chamber, and downward and then through the tubes, which effects a great saving of fuel and fire safe con-  
55 struction, as before specified.

s, is a water receptacle for moistening heated air.

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

1. A hot air furnace comprising a fire pot and combustion chamber above it provided with open ended flues, a casing surrounding said fire pot and combustion chamber, said casing forming a chamber N below the said  
60 tubes, a chamber Q at the side of the fire pot in communication with said chamber N, but out of communication with the tubes, a chamber F above the fire pot in communication with the upper end of the chamber Q, a cham-  
65 ber R at the opposite side of the fire pot from chamber Q and extending around back of said fire pot, said chamber R being in communication with the chamber F and with one end of said flues, and an outlet chamber at  
70 the opposite end of said flues whereby the air circulates as described.

2. A furnace comprising a fire pot, a combustion chamber above the same having horizontal open ended tubes, a lower L-shaped  
80 horizontal chamber around the fire pot, an upper L-shaped horizontal chamber around the combustion chamber, a horizontal chamber F above the combustion chamber in communication with the upper L-shaped cham-  
85 ber, a vertical chamber in communication with the chamber F and out of communication with the flues, the upper L-shaped chamber in communication with one end of the flues, and an outlet chamber at the opposite  
90 end of and in communication with the flues, substantially as specified.

3. The combination with a furnace having vertical air flues, a combustion chamber having horizontal tubes communicating with said  
95 air flues, a tube cleaner within the combustion chamber engaging said tubes, a rod or handle attached to the cleaner and extending to the outside of the furnace, and a tube extending through one of the said vertical air  
100 flues to the outside of the furnace and through which said rod passes for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

MAX RUDERT.

Witnesses:

ALLEN S. PATTISON,  
GEO. E. FRECH.