(No Model.)

F. C. ROBERTS.

REGENERATIVE HOT BLAST STOVE.

No. 462,739. Patented Nov. 10, 1891.

Fig. 1.

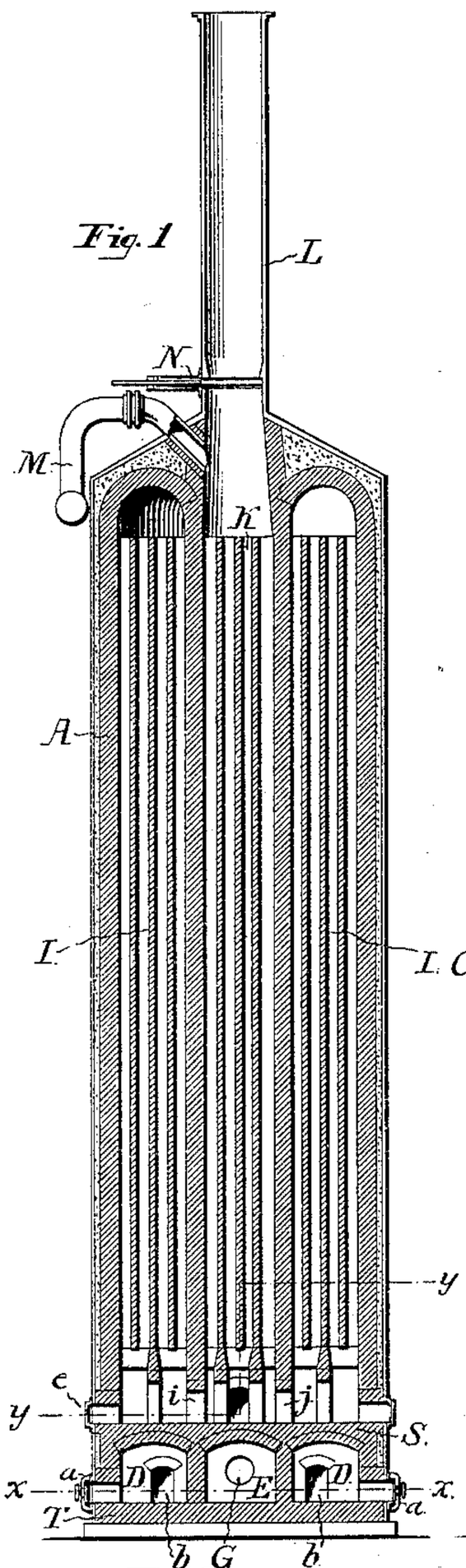


Fig. 4.

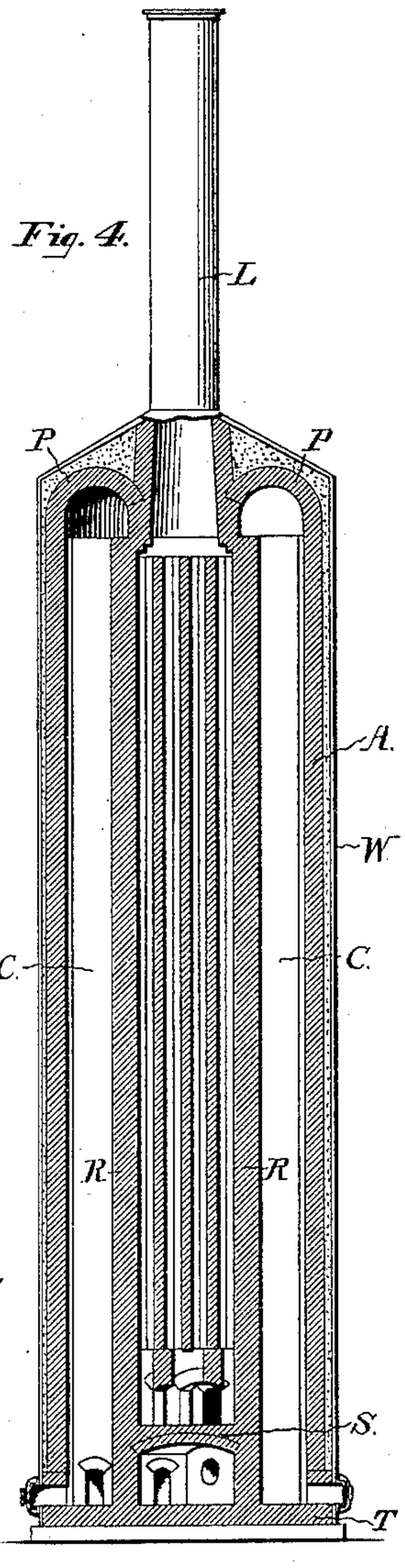


Fig. 2.

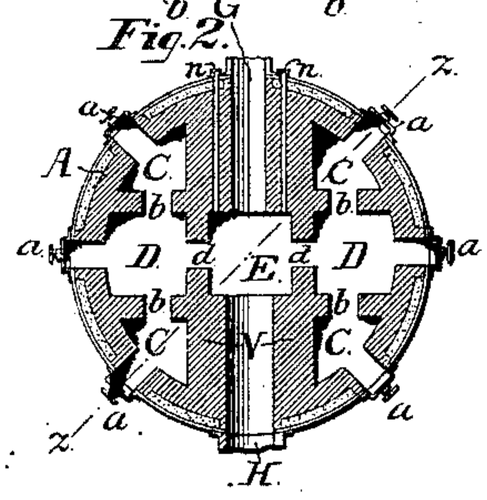
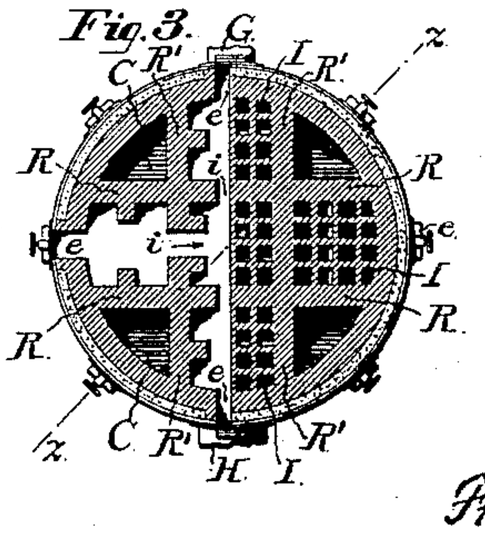


Fig. 3.



WITNESSES:

A. E. Paige.

F. D. Goodwin.

INVENTOR

Frank C. Roberts,

By Mollingsworth & Fraley,

attorneys.

UNITED STATES PATENT OFFICE.

FRANK C. ROBERTS, OF PHILADELPHIA, PENNSYLVANIA.

REGENERATIVE HOT-BLAST STOVE.

SPECIFICATION forming part of Letters Patent No. 462,739, dated November 10, 1891.

Application filed October 31, 1888. Serial No. 289,659. (No model.)

To all whom it may concern:

Be it known that I, FRANK C. ROBERTS, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Regenerative Hot-Blast Stoves, whereof the following is a specification, reference being had to the accompanying drawings.

In said drawings, Figure 1 represents a central vertical section through the stove. Fig. 2 is a horizontal section thereof on the line *x x* of Fig. 1. Fig. 3 is an irregular horizontal section upon two different planes, indicated by the irregular dotted lines *y y y* in Fig. 1. Fig. 4 is a central vertical section on a plane at an angle of forty-five degrees to that of Fig. 1, as indicated by the dotted lines *z z* in Fig. 2.

The stove is cylindrical in form and its chief characteristics are that it has four vertical combustion-chambers arranged in the respective quadrants, with regenerators intermediate between each pair thereof and a central regenerator arranged immediately beneath the chimney.

Other features of the invention contribute to the efficient operation of this system.

Referring to the drawings, T represents the base or foundation of the stove, and A the cylindrical outer wall, provided, if desired, with an exterior metal shell *w*, applied in the usual way. Vertical chord-walls R R′ extend from the bottom to near the top of the stove, the former rising directly from the foundation T, the latter from the heavy piers V V, whose tops coincide with the bottoms of three of the regenerators. These chord-walls divide the stove into nine vertical compartments, four of which C C C C extend from the foundation to near the top of the stove and are of quadrant shape in cross-section. The remaining five compartments (four of which I I I I are intermediate between the respective pairs of compartments C while the fifth K is in the center of the stove) extend from a floor S to near the top of the stove. These five compartments are the regenerators, while the four compartments C are the combustion-chambers. The floor S is placed a short distance above the base T and extends entirely across the stove, except in the quadrants occupied by the combustion-chambers. It is supported upon the piers V V and upon groined arches which spring from them and from the chord-walls R R′ to the outer wall A. Beneath the floor S are three chambers D D and E, the latter beneath the central regenerator and the others adjoining the chamber E on either side. The chamber E communicates with the chambers D D through the arched passage-ways *d d*, and each of the chambers D communicates with the immediately-adjacent pair of combustion-chambers C by means of similar arched passages *b b*. The chambers D D and the combustion-chambers C are provided at points below the level of the floor S with radially-arranged air-inlets *a*, having suitable valves, as indicated, the chambers E being also provided with air-inlets *n n*. The gas-inlet G extends inward through the center of one of the piers V and terminates in the chamber E, while on the opposite side of said chamber and extending through the other pier V is the exit-passage H for hot blast.

The filling of the regenerators may be constructed in any of the well-known modes and is therefore not particularly specified. Said filling, however, terminates a short distance below the top of the stove, and at that point groined arches P spring from the chord-walls R R′ to the outer wall A in such a manner as to leave a free communication between each of the regenerators I and the pair of combustion-chambers C, which are on either side of it. Those portions, however, of the chord-walls which inclose the central regenerator K are not thus arched, but extend upward without lateral openings and form the base of the chimney L. Thus while communication is free between the combustion-chambers C and the four other regenerators at the top there is no communication between the central regenerator K and the combustion-chambers or other regenerators at that point. At the bottom, however, of said central regenerator K four arched openings *i* are made in the inclosing portions of the chord-walls R R′, whereby communication is established between the bottom portion of said central regenerator and the four others I I I I.

The chimney L is provided with a valve N in the usual manner, and beneath said valve the air-blast inlet-pipe M enters.

Suitable doors *e* are provided at the bottom of each of the outer regenerators for cleaning purposes.

The mode of operation is as follows: The valves of the blast inlet-pipe M and the hot-blast outlet H being closed and the chimney-valve N and the valve of gas-inlet G being opened, the gas rushes into the central compartment E. Thence it escapes through the two passages *d d* into the compartments D D, and thence through the four passages *b b b b* to the combustion-chambers C C C C. The air-inlets *a n* being opened to the proper extent, combustion commences in the chambers E, D, and D, and is completed in the four combustion-chambers C C C C. The hot products of combustion rising to the top rush across into the four outer regenerators I I I I, and pass down until they reach the openings *i i i i*, through which they flow into the central regenerator K and ascend through it to the chimney L, by which they escape. This direction of the currents while the stove "on gas" is of course reversed when the stove is "on blast." The chimney-valve and the valves of the gas-inlet being then closed and the valves of the air-blast inlet M and hot-blast outlet H being opened, the air enters at the base of the chimney, passes down through the central regenerator K, thence out through the four openings *i* into the four outer regenerators I, through which it ascends to the top of the stove. It then passes across through the arches P into the combustion-chambers C and descends, after which it is conducted through the several passage-ways *b* and *b* to the central chamber E, whence it finds an exit at the hot-blast outlet H.

Among the advantages due to the above described construction is the following: The combustion-chambers afford a greater amount of heat-absorbing surface for the necessary cubical area, and, being of comparatively small diameter, tend to more efficiently abstract heat from and impart it to the passing currents. As the walls of the combustion-chambers are of course the most highly-heated portion of the stove, it is very desirable that their surface should be so disposed as to compel thorough contact. By placing the combustion-chambers symmetrically about the stove unequal expansion is avoided. The arrangement of the final regenerator centrally beneath the chimney gives a very efficient draft with a minimum of friction. The group of outer regenerators I I I I affords, as it were, a reservoir of hot air while the stove is on blast. Thus the currents are distributed throughout a very large area in that part of the stove and have time to thoroughly take up the heat therefrom, while the velocity of the blast at its entrance and exit remain constant. By admitting the gas to the preliminary combustion-chambers E, D, and D and partly consuming it there, I cause it to deposit the greater portion of the dust before entering the main chambers, and as the former are readily accessible cleaning is thus facilitated.

Having thus described my invention, I claim in a regenerative hot-blast stove provided with the usual system of gas and blast valves the following combinations:

1. The combination of the four combustion-chambers arranged in the respective quadrants, the four outer regenerators communicating therewith at top, the central regenerator arranged between the several pairs of combustion-chambers and communicating at bottom only with all of said outer regenerators, and the chimney arranged above and leading from the central regenerator, substantially as set forth.

2. The combination of the system of four combustion-chambers arranged in their respective quadrants, four outer regenerators arranged between the several pairs of combustion-chambers, and one central regenerator communicating in the manner set forth, with the subjacent preliminary combustion-chambers E D D, communicating with each other and with the main combustion-chambers, as and for the purposes specified.

FRANK C. ROBERTS.

Witnesses:
JAMES H. BELL,
EMMA REESE.