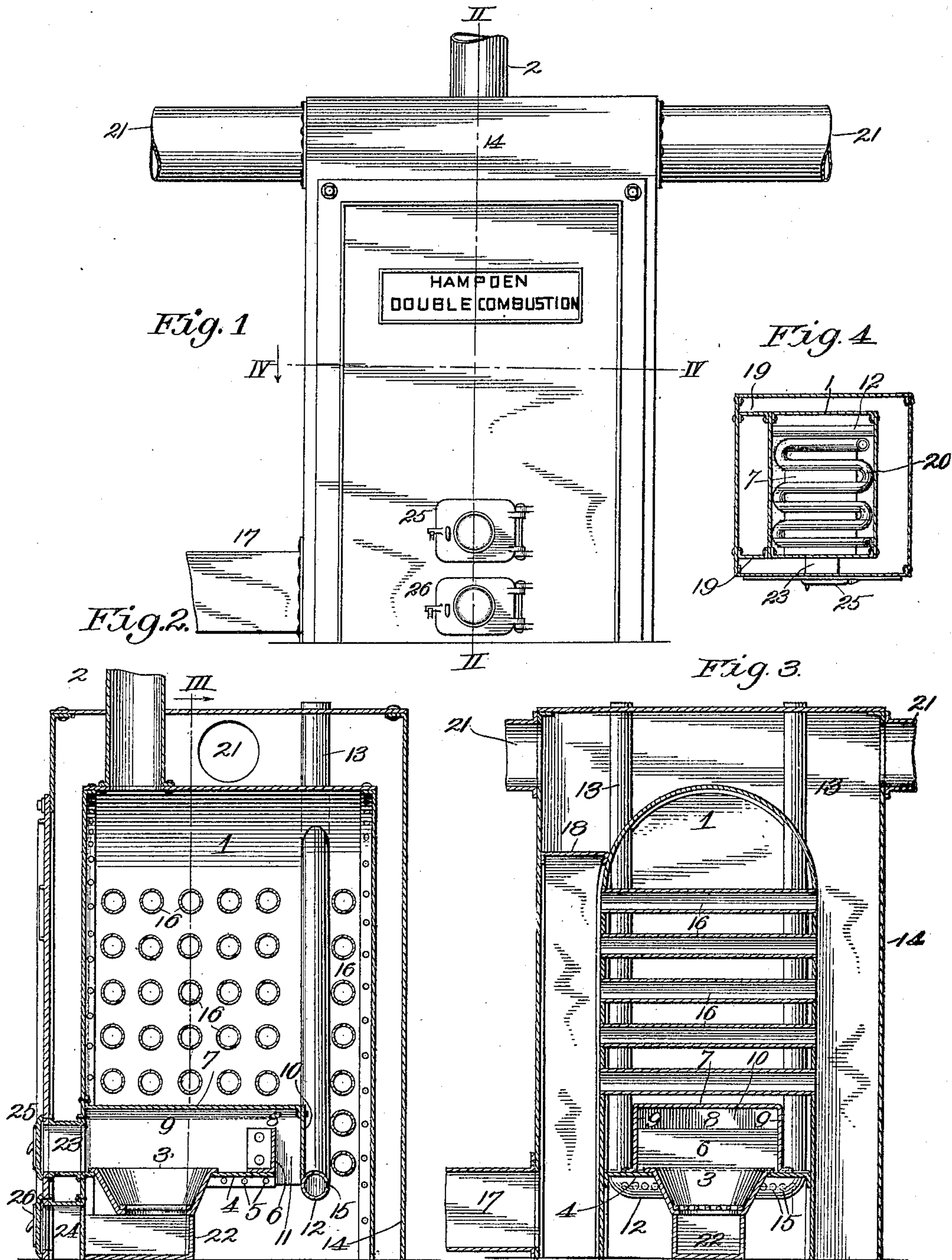


No. 812,789.

PATENTED FEB. 13, 1906.

W. R. HAMPDEN.  
FURNACE.

APPLICATION FILED JULY 22, 1905.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## FURNACE.

No. 812,789.

Specification of Letters Patent.

Patented Feb. 13, 1906.

Application filed July 22, 1905. Serial No. 270,762.

*To all whom it may concern:*

Be it known that I, WELLESLEY R. HAMPDEN, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to furnaces, and more especially to that class of furnaces having a double combustion, whereby the combustible gases which escape from the fire-pot or pipe leading thereto, my object in this connection being to produce a furnace of the character named in which the fire-pot is highly heated for the purpose of expanding the fuel therein, and thereby tending to produce a more complete combustion and as a result a more economical operation of the furnace.

With this object in view the invention consists in certain novel and peculiar features of construction and organization, as hereinafter described and claimed, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 is a front view of a furnace embodying my invention. Fig. 2 is a vertical section on the line II II of Fig. 1. Fig. 3 is a section taken on the line III III of Fig. 2. Fig. 4 is a horizontal section, on a reduced scale, taken on the line IV IV of Fig. 1.

In the said drawings, 1 indicates the shell or body of the furnace, preferably arched from side to side at its upper end and provided with a pipe 2, leading to the smoke-stack. (Not shown.) In the lower part of said shell is a fire-pot 3 of the form shown or of any other suitable configuration or type, said fire-pot preferably depending from a plate 4, secured, as at 5 or otherwise, to the side walls of the shell and terminating some distance from the back wall of said shell. Rising from the rear end of plate 4 is a wall 6, which terminates a suitable distance below an arch 7 in order that the heat and other products of combustion rising from the grate of the fire-pot must pass rearwardly through the substantially horizontal and long narrow passage 8 between wall 6 and the top of arch 7, the side walls 9 of the arch depending, by preference, to about the plane of the top of

the fire-pot, and depending from the rear end of the arch is a plate 10, which, in conjunction with wall 6, provides a narrow passage 11 for the products of combustion to escape from the arch.

Extending transversely of and at the lower end and rear side of passage 11 is an air-pipe 12, which pipe communicates with the atmosphere at its ends, the preferred construction being to have said pipe equipped with substantially vertical branches 13, which shall extend up through the shell or body and also through the air-casing 14, inclosing the shell or body, when the apparatus is used as a hot-air furnace, said pipe 12 being provided at its rear side, by preference, with a series of jet-orifices 15 to discharge air toward the back wall of the shell or body for a purpose which hereinafter appears. The shell or body is equipped when the apparatus is used as a hot-air furnace with a large number of air-tubes 16, extending transversely, by preference, there being enough of such air-tubes to accommodate the volume of air which is introduced into the casing 14 through the air-supply tube 17. In order that all of the air entering the casing shall pass through said tubes 16, and thus be subjected to the heat-generated, the space between one side of the shell or body and the corresponding side of the casing is arched by a plate 18 and isolated from the end space by end plates 19 as shown most clearly in Fig. 4, which figure illustrates the furnace as a hot-water furnace and is equipped with a casing for the sole purpose of bringing out the relation of plates 19 to the shell and casing, said figure illustrating in lieu of tubes 16 water-coil 20. Of course the furnace provided with the water-coil instead of the air-tubes may be equipped with the casing, if desired; but if so the casing would be simply employed as a jacket to prevent external radiation of heat in the engine-room or cellar where it is not desired.

The hot-air furnace is of course provided with the usual tubes or pipes 21 to conduct hot air to the various points desired and is also provided with the usual or any preferred ash-pit 22 below the grate, and supporting the latter, if desired, and the fire-pot and ash-pit chambers are provided with the customary tubes 23 and 24, respectively, leading to the front side of the furnace-casing, and said



tubes are closed by the customary doors 25 and 26, respectively.

In practice the fire is built in the fire-pot in the usual manner, and until it gets well started the ash-pit door or its slide (not shown) is left open, the products of combustion passing from the fire-pot through passage 8 down through passage 11 and into the chamber below, part of the products of combustion partially surrounding the fire-pot, so as to highly heat the same, and thereby expand the fuel therein, and therefore more quickly and thoroughly liberating the combustible gases thereof. The major portion of the heat and products of combustion pass from such chamber rearwardly under the air-pipe 12 and then upwardly rearward of the same, and in such passage is thoroughly mixed with the air, being discharged rearwardly through orifices 15, so that such gases may ignite instantly and burn with such fierceness that all of the smoke and combustible gases, soot-producing properties, &c., are consumed, the flame being separate and distinct from that of the fire-pot and extending up through the shell and in contact with practically all of the air-tubes or water-coil tubes, as the case may be, therein, the non-combustible gases passing up through the pipe 2, it being understood in this connection that as soon as sufficient heat is generated to start the second combustion described the air-supply through the bottom of the grate is cut off. It will further be noted in this connection that the branches of the air-tube are also subjected to the intense heat of the flame from the burning gases and smoke and that in consequence the air which is discharged through orifices 15 is hot, and therefore insures a more thorough combustion than if such air was cold or less highly heated, as would be the case if the end of the air-tube communicated with the atmosphere without being first conducted a comparatively long distance through the second combustion-chamber, as will be readily understood.

With a furnace of this character practically all of the heat of the fuel employed is utilized, and as a consequence the operation takes place with an economic consumption of fuel. It will also be understood that because the air has no access to the sides or the bottom of the mass of fuel no clinkers will be formed, and the residuum in the form of ashes will be small.

From the above description it will be apparent that I have produced a double combustion-furnace possessing all of the features of advantage enumerated as desirable and which is susceptible of modification in minor particulars without departing from the principle of construction and operation or sacrificing any of its advantages.

Having thus described the invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. A furnace, comprising a shell or body, a fire-pot therein, a wall rising upwardly rearward of the fire-pot, an arch over said fire-pot and said wall and projecting rearwardly beyond the latter, a plate disposed between and out of contact with said upwardly-projecting wall and the rear wall of the shell and depending from the arch, an air-tube at the rear side of said depending plate and provided with air-jet orifices, and provided with one or more branches extending up through and within the shell and communicating with the atmosphere, and a combustion-flue communicating with the upper portion of the shell.

2. In a furnace, the combination of a shell or body, a fire-pot therein, a wall rising upwardly rearward of the fire-pot, an arch over said fire-pot and said wall and projecting rearward beyond the latter, a plate disposed between and out of contact with said wall and the rear wall of the shell and depending from the arch, an air-tube at the rear side of said depending plate and provided with air-jet orifices and one or more branches extending up through and within the shell and communicating with the atmosphere, a combustion-flue communicating with the upper portion of the shell, and a series of tubes within the shell between the air-tube and the combustion-flue.

3. In a furnace, the combination of the shell, a substantially horizontal plate connecting the sides and front wall of the shell and terminating short of the rear wall thereof, a fire-pot disposed below said plate and communicating with the space above the same, an ash-pit below the fire-pot, an arch above the fire-pot and said plate and projecting rearwardly beyond the latter, a wall projecting from said plate rearward of the fire-pot and terminating short of the top of the arch and extending from side wall to side wall of the latter, a plate depending from the rear end of the arch to a point below the top of the wall below the arch, a transverse perforated pipe disposed contiguous to the lower end of the passage between the wall below the arch and the wall depending from the rear end of the arch and communicating at its ends with the atmosphere, and a combustion-flue communicating with the upper part of the shell.

4. In a furnace the combination of a shell, a substantially horizontal plate connecting the sides and front wall of the shell and terminating short of the rear wall thereof, a fire-pot disposed below said plate and communicating with the space above the same, an ash-pit below the fire-pot, an arch above the fire-pot and said plate and projecting rearwardly beyond the latter, a wall projecting from said plate rearward of the fire-pot and terminat-



ing short of the top of the arch and extending  
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to a point below the top of the wall below the  
5 arch, a transverse perforated pipe disposed  
contiguous to the lower end of the passage be-  
tween the wall below the arch and the wall  
depending from the rear end of the arch and  
communicating at its ends with the atmos-  
10 phere, a combustion-flue communicating  
with the upper part of the shell, tubes ex-  
tending completely through the shell in a  
plane above the arch of the fire-pot, a casing  
fitting over the shell and partitioned into two

portions one of which communicates with one 15  
end of the series of tubes and the other with  
the other end of the series of tubes, a cold-air-  
supply tube communicating with one of the  
partitioned portions of the casing, and dis-  
charge-tubes communicating with the other 20  
partitioned portion of the casing above said  
tubes.

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

WELLESLEY R. HAMPDEN.

Witnesses:

H. C. RODGERS,  
G. Y. THORPE.