Oct. 6, 1931. H. JUNKERS 1,825,735

HEATING STOVE

Filed Sept. 3, 1926

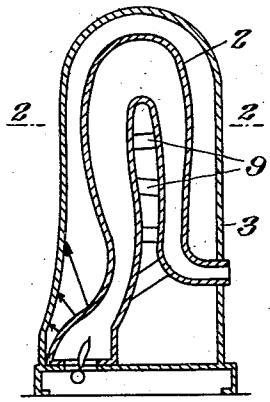
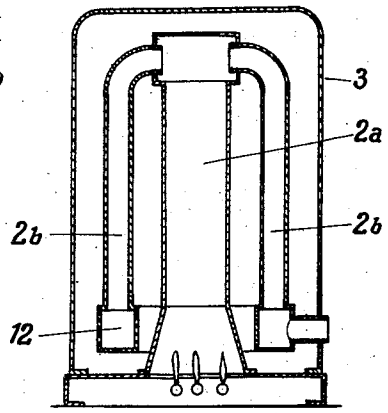


Fig. 1.

Fig. 3.



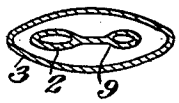


Fig. 2.

Fig. 4.

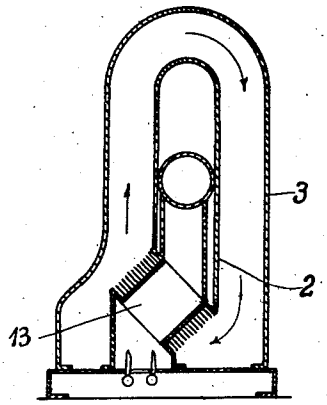
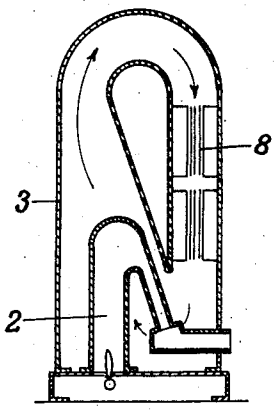


Fig. 5.



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UNITED STATES PATENT OFFICE

HUGO JUNKERS, OF DESSAU, GERMANY

HEATING STOVE

Application filed September 3, 1926, Serial No. 133,492, and in Germany August 8, 1925.

My invention refers to heating stoves more especially of the kind in which a tubular or other shell traversed by hot gases is surrounded by an outer shell spaced from it. It has special reference to heating stoves as described and claimed in my patent of the United States No. 1,614,439. In the stoves disclosed in this copending application the heat was emitted by radiation from an inner to an outer shell, the space between the two shells being closed at least on one side and the distance between the two shells diminishing from the entrance to the exhaust end of the inner shell in order to obtain a uniform surface temperature on the outer shell. This means of equalizing and keeping low the temperature of the surface of the outer shell involves a more or less conical form of one or both shells.

According to the present invention now I have found that I can obtain the desired equalization of the temperature of the surface of the outer shell also by other means, which are preferable both from a technical and from an economical point of view.

According to the present invention I provide means associated with one or both of said shells, which secure a transmission of heat from the inner to the outer shell resulting in a substantially uniform surface temperature throughout the length of the outer shell.

I have found it particularly advantageous to employ an inner shell bent upon itself so as to be composed of an ascending and a descending branch, the current of hot gases being thus compelled to first flow in one and then in the opposite direction. An arrangement of this kind has the effect that the ascending branch having the higher temperature and the descending branch having the lower temperature will cooperate in forming at all points a substantially uniform average temperature, so that a uniform transmission of heat is obtained throughout the height of the stove and the surface temperatures of the outer shell are substantially uniform and comparatively low. I can further increase this effect by providing for a conductive connection in one or more points of the ascending and descending branches of the inner shell, so that the flow of heat across these connections will act towards further improving the equalizing of temperature. Preferably the cross-sectional area of the U-shaped inner shell is enlarged in the ascending branch and diminishes towards the exhaust end, so that with the increasing height of the stove an increase in the heating surface is obtained which also acts towards keeping the quantity of heat transmitted by radiation and in consequence thereof also the surface temperature of the outer shell substantially equal in all places.

I have further found that it is possible to keep the surface temperature of the outer shell low, particularly near the entrance end of the heating gases by arranging the inner shell or the combustion chamber forming part thereof in inclined position in such manner that the transmission of heat by radiation from the hottest part will act on a greater part of the surface of the outer shell and will only gradually take place on the shortest way.

In all the arrangements a transmission of heat by convection can also be obtained by imparting to the space enclosed between the two shells such dimensions and form that they favor a permanent circulation of the air enclosed therein. This can for instance be obtained by forming the space between the two shells as an endless conduit. The partial transmission of heat by convection, which is thus obtained, acts in an equalizing manner towards a uniform surface temperature of the outer shell, which can be so perfect that other means for influencing the transmission of heat can even be dispensed with altogether.

I have found that the application of the present invention to radiator stoves being a combination of a plurality of heating elements offers particular advantages for the reason that the means for obtaining a uniformity of the surface temperature render it possible to arrange the inner and outer shells close together, whereby thinner heating elements are obtained, the combination

of which results in a stove requiring less room. If the means disclosed above are distributed over the circumference of the shells it is possible to obtain a very uniform surface temperature also with flat or elliptic heating elements, inasmuch as such elements allow utilizing the space available particularly easily, while on the contrary the obtention of a uniform and comparatively low temperature with heating elements of this kind as hitherto used proved particularly diffcult. If radiators of this kind are used as heating elements, in which the path of the hot gases is reversed, I obtain the further advantage that the entrance and exhaust ends of the hot gases are arranged close together and in a low position, so that the exhaust gas collecting conduits hitherto arranged at the upper ends of the heating elements can be dispensed with and the heating surfaces are therefore readily accessible from everywhere and can easily be cleaned.

In the drawings affixed to this specification and forming part thereof several forms of an oven embodying my invention are illustrated diagrammatically by way of example.

In the drawings

Figs. 1 and 2 are a vertical and cross section, respectively, of one form of a stove according to my invention.

Fig. 3 is a vertical section of a stove having the inner gas-heated shell connected to intermediate heating conduits.

Fig. 4 is a similar view of a stove provided with means for effecting an automatic circulation of the air enclosed between the two shells, and

Fig. 5 is a vertical section of a stove in which the heat radiation surfaces of the outer shell are enlarged by ribs.

Referring first to Figs. 1 and 2, 2 is the inner shell in direct contact with the hot gases and 3 is the outer shell, which is spaced from but connected with the inner shell both at the top and at the bottom in a gas-tight manner and is heated mainly by radiation.

The inner shell 2 is bent upon itself, having substantially U-shape, and the hot gases entering at the bottom are thus forced to flow first in upward and thereafter in downward direction. In order to secure a uniform radiation of heat from the inner to the outer shell the two branches of the inner shell are connected either in some places or all over their length by heat-conductive members 9, and in consequence of this arrangement the equalization of temperature already occurs at the inner shell itself. In order to prevent the outer shell from getting over-heated near the entrance end of the hot gases, this part of the inner shell is preferably inclined in such manner that, as shown by the arrows in Fig. 9, the transmission of heat by radiation from the hottest parts of the inner shell will take place towards a larger part of the outer shell.

The stove illustrated in Fig. 3 is particularly adapted for the heating of large rooms. In this stove the hot gases ascend in an inner shell $2a$ surrounded at its bottom end by an annular conduit 12 which is connected with the top portion of the inner shell by branch conduits $2b$. From the annular conduit 12 the gases can escape across the intervening space and across the wall of the outer shells 3.

Fig. 4 shows means whereby a permanent automatic circulation of the air enclosed between the two shells is obtained. In Fig. 4 a heat radiating tube 13 is inserted in the inner shell in such manner that a bend is formed between two substantially parallel parts of this shell.

In the oven illustrated in Fig. 5 the heat radiating surfaces are enlarged by the arrangement of ribs 8 in those parts of the outer shell 3 which are arranged at a greater distance from the inner shell 2.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:—

1. Heating stove comprising an inner shell arranged to be traversed by hot gases, an outer shell spaced from and surrounding said inner shell, the space enclosed between the two shells being secured against the entrance of air and of the hot gases traversing said inner shell, and means associated with one of said shells for securing a transmission of heat from the inner to the outer shell resulting in a substantially uniform surface temperature throughout the length of said outer shell.

2. Heating stove comprising an inner shell bent upon itself and arranged to be traversed by hot gases, an outer shell spaced from and surrounding said inner shell, the space enclosed between the two shells being secured against the entrance of air and of the hot gases traversing said inner shell and means associated with one of said shells for securing a transmission of heat from the inner to the outer shell resulting in a substantially uniform surface temperature throughout the length of said outer shell.

3. Heating stove comprising an inner shell bent upon itself and arranged to be traversed by hot gases, the cross-sectional area of said inner shell first increasing and then decreasing from the entrance to the exhaust end, an outer shell spaced from and surrounding said inner shell, the space enclosed between the two shells being secured against the entrance of air and of the hot gases traversing said inner shell, and means associated with one of said shells for secur-

ing a transmission of heat from the inner to the outer shell resulting in a substantially uniform surface temperature throughout the length of said outer shell.

4. Heating stove comprising an inner shell bent upon itself and arranged to be traversed by hot gases, an outer shell spaced from and surrounding said inner shell, the space enclosed between the two shells being secured against the entrance of air and of the hot gases traversing said inner shell, a heat-conductive connection between said shells and means associated with one of said shells for securing a transmission of heat from the inner to the outer shell resulting in a substantially uniform surface temperature throughout the length of said outer shell.

5. Heating stove comprising two concentric shells spaced from one another and connected in a gas-tight manner so as to form a closed space between them, the space enclosed between the two shells being secured against the entrance of air and of the hot gases traversing said inner shell, and a gas conduit extending from the inner shell across said space and through said outer shell.

6. Heating stove comprising an inner shell arranged to be traversed by hot gases, an outer shell spaced from and surrounding said inner shell, the space enclosed between the two shells being secured against the entrance of air and of the hot gases traversing said inner shell and means associated with the entrance end of said inner shell for reducing radiation of heat towards said outer shell.

7. Heating stove comprising an inner shell arranged to be traversed by hot gases, said inner shell being formed with a bend between two substantially parallel parts, and an outer shell spaced from and surrounding said inner shell, said shells being connected in a gas-tight manner, the space enclosed between the two shells being secured against the entrance of air and of the hot gases traversing said inner shell.

In testimony whereof I affix my signature.

HUGO JUNKERS.