

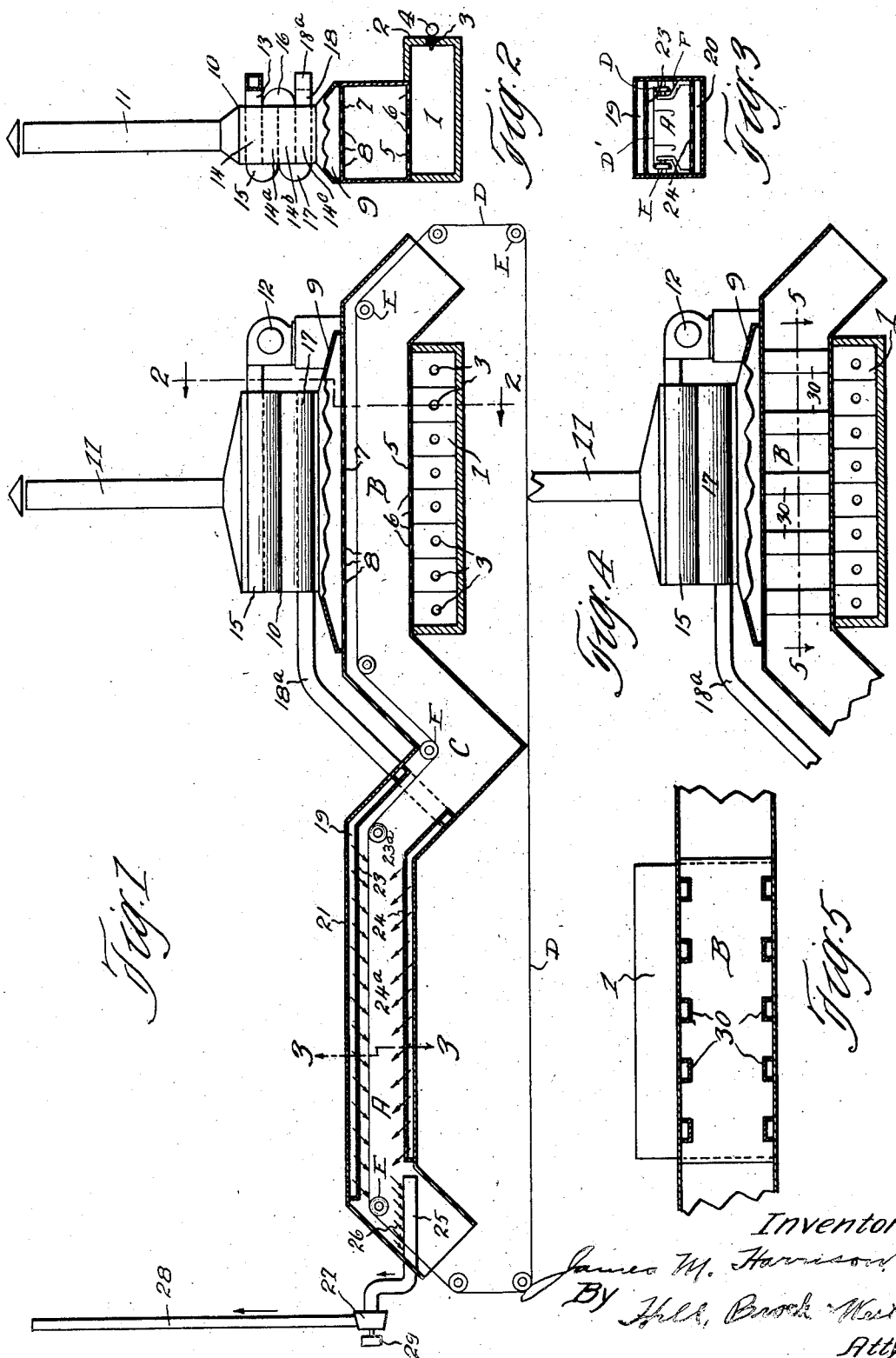
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APPARATUS OR SYSTEM FOR DRYING, BAKING, ETC

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APPARATUS OR SYSTEM FOR DRYING, BAKING, ETC.

Application filed December 22, 1923. Serial No. 682,355.

To all whom it may concern:

Be it known that I, JAMES M. HARRISON, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Apparatus or Systems for Drying, Baking, Etc., of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to a heating system especially adapted for such purposes as drying, baking and oxidizing articles, and particularly the coatings thereon. In the form shown herein, the system is used in conjunction with a multi-stage oven of the continuous or semi-continuous type, although not limited in its application to the particular oven shown and described herein.

The general purpose and object of the invention is to provide a system or apparatus which will enable the heating of the articles to be realized in a particularly efficient manner and one which will result in a great saving of heat energy as compared with other and well known systems now on the market. Further and more limited objects of the invention will appear in connection with the detailed description in the specification and will be accomplished through the combinations set forth in the claims.

In the drawings, Fig. 1 represents a longitudinal sectional elevation through a multi-stage oven of the continuous or semi-continuous type having my invention applied thereto; Figs. 2 and 3 are details in section corresponding respectively to the lines 2—2 and 3—3 of Fig. 1; Fig. 4 a sectional elevation of the right-hand portion of the system shown in Fig. 1 and illustrating a modification of such system; and Fig. 5 a detail in section corresponding to the line 5—5 of Fig. 4.

Describing the various parts by reference characters, A and B denote the first and second parts or sections of a multi-stage oven of the continuous or semi-continuous type, only two such parts or sections being necessary to show the application of my system to ovens of this type. These sections are connected by an intermediate section C which constitutes a seal for preventing the mingling of the gases or vapors in the sections A and B, the parts thus far described being of standard, ordinary construction. The articles to be treated in the

oven are conducted through the same from left to right, in the usual manner, as by a conveyor. The conveyor is indicated conventionally in Figs. 1 and 3 of the drawing, the side members being indicated at D, cross members at D', and the sprockets at E. The sprockets within the sections A and B are supported by inwardly projecting standards F between the upper ends of which and the side walls of the casing sections, the sprockets E are arranged. This inward projection of the brackets F enables the conveyor to be moved through the section A without interference with the flue or pipe 25, located at one side of the section A, and to which reference will be made hereinafter. Beneath the second part or section B of the oven is a combustion chamber 1 the front wall 2 of which is provided with openings 3 for burners 4, which burners may be adapted for the burning of gas or oil. The upper wall 5 of the combustion chamber is the lower wall of the oven section B and is provided with perforations 6, distributed throughout the extent of such wall, enabling the products of combustion and the heated air to pass into the section B. The upper wall 7 of this section is also perforated, as shown at 8, and preferably uniformly throughout the extent thereof, and is arranged to discharge into a hood 9 thereabove. Projecting upwardly from and communicating with the hood is the casing 10 of an air heater having a flue or stack 11. 12 denotes an air blower which is shown as delivering air to a header 13 extending across the rear of the casing 10, said header communicating with a duct or a series of ducts 14 extending therefrom to the front wall of the casing and there communicating with a pass-hood 15. By means of this pass-hood the air is conducted through a flue or flues 14^a to a second pass-hood 16 and thence through a transverse flue or flues 14^b, pass-hood 17, and a similar transverse flue or flues 14^c into the header 18.

Extending across the rear of the casing directly below the header 13 is a pipe 18^a which extends from the header 18 to and communicates with the downwardly directed portions of top and bottom chambers 19 and 20 arranged respectively beneath the top and above the bottom walls 21 and 22 of the oven section A. These chambers preferably extend each the full width of the oven section A and are provided with open-

ings 23^a and 24^a in their bottom wall 23 and top wall 24, respectively, which openings are arranged to discharge the heated air supplied thereto by the pipe 18^a to the articles within such section. These openings are arranged so as to discharge the heated air rearwardly, as indicated by the arrows. The heated air, together with the vapors and the gases formed in the section A, will be removed by means of an offtake flue or pipe 25 having openings therein for such vapors and gases, as indicated by the arrows 26, said pipe communicating with the casing of an exhaust fan, indicated at 27, from which casing leads the off-take pipe or flue 28. 29 indicates a conventional pulley for driving the fan (not shown).

The air heater is of such a type as to utilize in a very efficient manner the hot gases (consisting of products of combustion and air) discharged into the hood 9. Any type of heater that will secure an efficient heat interchange between the air forced through the heater and the hot gases will answer the purpose; but I prefer a heater such as shown in my application No. 507,604, filed October 14, 1921, wherein the hot gases are conducted through elongated narrow vertical flues provided between horizontal sheet metal flues through which the air is circulated. With a heater of this construction, I am enabled to reduce the temperature of the hot gases 300° F. to 350° F.—say from 450° F. to 150° F. or lower—in their passage between and in contact with the series of horizontal air-circulating flues, with a corresponding elevation in the temperature of such air.

In operation, the products of combustion, mingled with heated air, will be delivered into the upper section B at approximately 900° F. and will be reduced by expansion and by contact with oven walls and the articles subjected thereto, to a temperature of 450° F. being discharged into the hood 9 at about the last-mentioned temperature. Air, heated by such gases to a temperature of approximately 300° F. to 350° F. will be conducted through the pipe 18^a to the distributing chambers 19 and 20 and will be supplied thence in contact with the articles being conveyed through the oven section A. The air, laden with vapors or gases absorbed from the said articles and the coatings thereon, will be removed through the pipes or flues 25 and 28.

In Figs. 4 and 5 there is shown a modification of my invention in which the products of combustion from the chamber 1 are not delivered directly into the oven section B, but are used for the indirect heating of such oven section. This indirect heating may be effected by conducting the products from said chamber through vertical radiating flues 30 extending upwardly along the

opposite side walls of the oven section and projecting into such section. The hot gases will be delivered from the flues 30 into the hood 9 and will operate to heat the air forced through the casing 10 in the same manner as described in connection with the form of my invention set forth in Figs. 1-3 inclusive.

The system described here-within may be used for the efficient heating or drying of articles having coatings which, if subjected to the products of combustion in the first instance, will form therewith solvents, causing the coatings to run off. In the operation of my system, the coatings are given their preliminary "set" by means of the hot air supplied to the oven section A; and by the time such articles reach the chamber B, the hot gases or products of combustion will not injure the coatings but will serve to complete the drying and hardening thereof.

The seal at the point C effectively prevents the mingling of air in the section A with the products of combustion in the oven section B.

Because of the manner of utilizing the products of combustion to heat the air supplied to the oven section A, I am enabled to effect a great reduction in the amount of air necessary to be circulated in order to dry, heat or bake the articles and their coatings and am also enabled to effect a very great saving in fuel consumption.

Having thus described my invention, what I claim is:

1. A system or apparatus comprising a pair of oven sections communicating in series for the continuous conveyance of articles therethru, means for applying heat to the second oven section, an air heater arranged to be heated by the heated gases passing beyond such second oven section, means for forcing air thru such heater, and means for delivering the same into the first oven section.

2. A system or apparatus comprising a pair of oven sections communicating in series, means for applying heat to the second section of said oven, an air heater arranged to be heated by the heated gases passing beyond such second oven section, means for forcing air thru such heater, means for delivering the same into the first oven section, and means preventing the intermingling of the atmospheres in such oven sections.

3. A system or apparatus comprising a pair of oven sections communicating in series for the continuous conveyance of articles therethru, a heater applied to the bottom of the second section and arranged to heat the same, an air heater adapted to receive the heated gases after the same have passed the second oven section, means for

circulating air thru said air heater, and means for delivering the same into the first oven section.

4. A system or apparatus comprising a pair of horizontally arranged oven sections, with an air seal interposed therebetween, a heater applied to the second section, an air heater adapted to receive the hot gases after the same have heated such second section, means for circulating air through the second heater, an upper and lower heated air distributing chamber within the first oven section and communicating with the said air heater, and means for removing the heated air and vapors from the first oven section.

5. A system or apparatus comprising a pair of oven sections arranged in series and through which articles are adapted to be moved, a combustion chamber arranged beneath the second section, means for burning fluid fuel within said combustion chamber to heat said second oven section, a casing above the second oven section adapted to receive such products of combustion, means for forcing air through such casing, out of contact with the products of combustion, means for delivering such air to the first oven section, and means preventing the intermingling of the atmospheres in such oven sections.

6. A system or apparatus comprising a pair of oven sections arranged in series and through which articles are adapted to be moved, with an interposed wall forming an air seal between said sections, a combustion chamber arranged beneath the second section, means for burning fluid fuel within said combustion chamber and for delivering the products of combustion therefrom into said second oven section, a casing above the second oven section adapted to receive such products of combustion, means for forcing air through such casing, out of contact with the products of combustion, and means for delivering the air thus heated to the first oven section.

7. A system or apparatus comprising in combination a pair of oven sections arranged in a series and through which articles are adapted to be conducted, a combus-

tion chamber arranged below the second oven section, the top and bottom walls of such second oven section having openings therethrough to permit the passage of the products of combustion vertically through such section, an air heater above such second section and adapted to receive the products of combustion therefrom, means for forcing air through such heater, out of contact with the products of combustion, and means for delivering such heated air to the first oven section.

8. A system or apparatus comprising a pair of oven sections arranged in series and through which sections articles are adapted to be conducted, a combustion chamber arranged beneath and substantially co-extensive with the bottom wall of the second oven section, the said bottom wall having openings for the passage of products of combustion from said chamber, an air heater arranged above such second section receiving the products of combustion therefrom, and means for circulating air through such heater and means for delivering the same into the first oven section.

9. A system or apparatus comprising a pair of oven sections arranged in series with an interposed wall forming an air seal therebetween, and through which sections articles are adapted to be conducted, a combustion chamber arranged beneath and substantially co-extensive with the bottom wall of the second oven section the said bottom wall having openings therethrough for the passage of products of combustion from said chamber, the upper wall of the second oven section also having openings adapted to permit the passage of the products of combustion therethrough, a collecting hood arranged above such perforated upper wall, an air heater receiving the products of combustion from said hood, means for circulating air through such heater and means for delivering the same into the first oven section.

In testimony whereof, I hereunto affix my signature.

JAMES M. HARRISON.