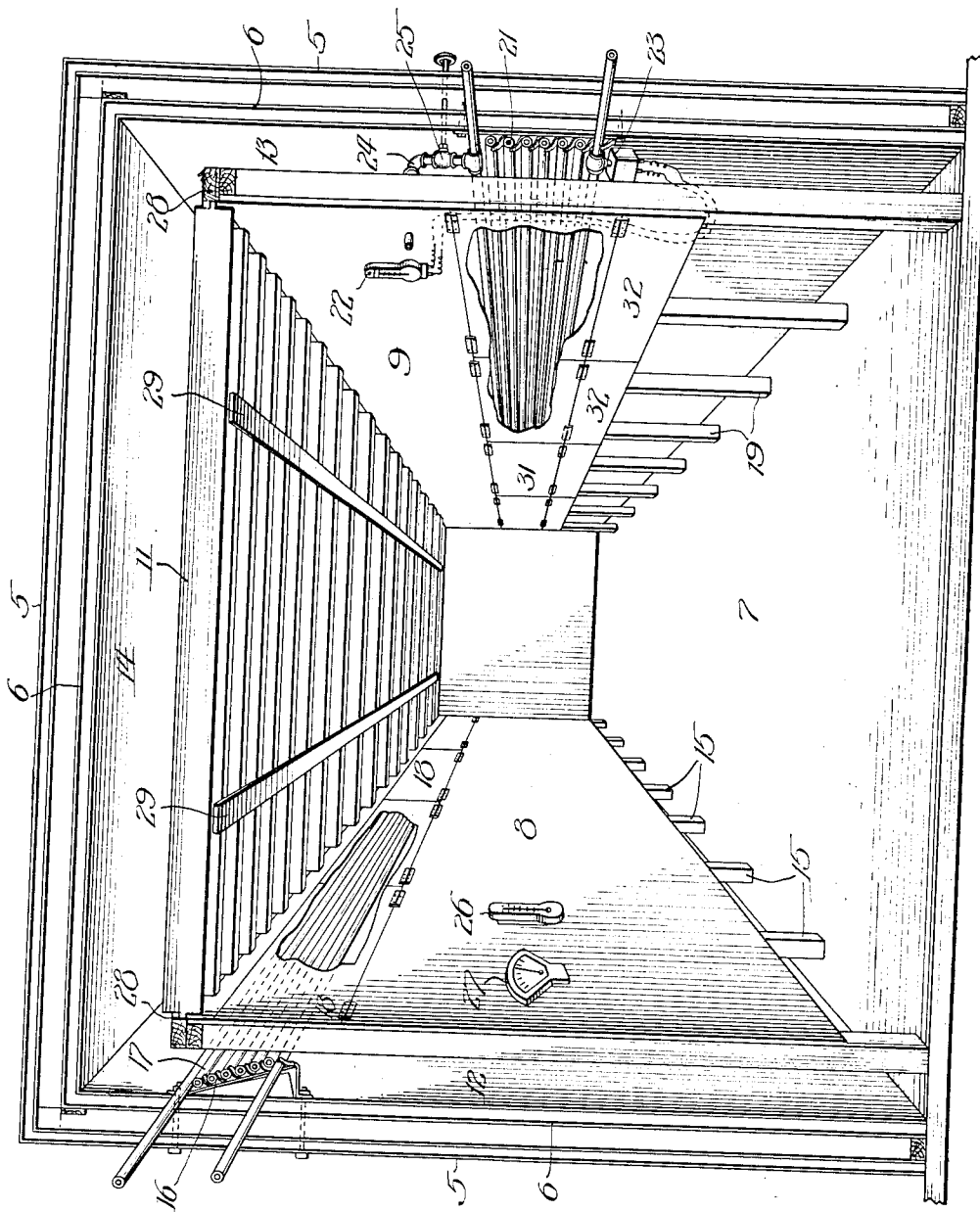


E. E. PERKINS.
 DRYING KILN.
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1,120,625.

Patented Dec. 8, 1914.



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DRYING-KILN.

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To all whom it may concern:

Be it known that I, ELMER E. PERKINS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Drying-Kilns, of which the following is a specification.

This invention relates to drying kilns in general and more particularly to kilns designed for drying piano cases, vehicle bodies or like articles which have been veneered or coated with stains, varnishes, enamels, japans, etc.

The successful drying of various kinds of articles requires a modulation of the temperature, humidity and circulation in the drying room correlative with the character of the articles being dried and one of the primary objects of the present invention is the provision of a kiln in which the circulation of the air and the humidity and temperature of the drying room can be regulated and controlled to a fine degree of nicety in conformity with the requirements of the objects being dried.

The invention will be best understood by reference to the following description when considered in connection with the accompanying drawings the single figure of which shows a perspective view of a drying kiln embodying one form of the invention.

By referring to the drawings it will be observed that the kiln comprises outer walls 5 and inner walls 6 spaced therefrom to form a dead air space between the walls. These walls may be constructed in any preferred manner and are employed merely to produce a heat insulated compartment within which the drying kiln proper is located. The drying room within which the material to be dried is placed comprises the floor 7, the side walls 8 and 9 and the ceiling 11, the side walls and ceiling being spaced from the surrounding walls 6 to form a cooling chamber 12 on one side of the drying room, a heating chamber 13 at the opposite side and a circulating passageway 14 connecting the heating and cooling chambers above the ceiling. The side wall 8 is preferably constructed of uprights 15 to the inner faces of which is secured wooden sheathing which, in the preferred construc-

tion, is covered with asbestos board and galvanized iron. The lower edge of the sheathing is spaced from the floor 7 as shown to afford communication between the cooling chamber 12 and the drying room near the bottom of the room. Within the cooling chamber and near the top thereof is mounted a bracket 16 carrying the cooling coils 17 which are connected with any suitable source of cooling medium which is circulated through the coils. The air which is cooled by the coils settles to the bottom of the cooling chamber and is discharged into the drying room around the articles to be dried. The wall 8 is provided with doors 18 in front of the coils 17 which may be opened to permit access to the coils whenever desired. The wall 9 on the opposite side of the drying room is also made of uprights 19 covered with sheathing, asbestos board and galvanized iron and the lower edge of the wall proper is likewise spaced from the floor 7 to establish communication between the drying room and the heating chamber 13. The lower edge of the wall, however, is considerably higher than the lower edge of the wall on the opposite side of the room to facilitate withdrawal of air from the drying room into the heating chamber as will be later explained more at length. Within the heating chamber 13 are located the heating coils 21 connected with any suitable source of heating medium, the coils in most cases being connected with a steam supply which circulates steam through the coils to heat the air in the chamber 13 which causes it to rise and pass through the circulating passageway 14 over the drying room to the cooling chamber 12 where it is cooled and thereupon settles as previously described.

In order that the temperature of the air in the kiln may be automatically regulated I have provided a thermostat 22 located inside the drying room and connected by any approved means with a thermostatically controlled valve 23 located in the inlet pipe to the heating coils. The thermostat automatically actuates this valve to control the admission of heating medium to the coils thereby regulating the temperature of the kiln.

For the purpose of moistening the air in the drying room I have provided a branch pipe 24 leading from the heating coils and opening into the room as shown, the admission of steam into the drying room through this pipe being controlled by a hand actuated valve 25. A registering thermometer 26 and a registering hygrometer 27 may be located within the drying room to record the temperature and humidity of the air.

The ceiling 11 is composed of a series of shutters pivoted at 28 in the side walls, the shutters being connected together by longitudinally extending members 29 so that they may be simultaneously actuated to close the ceiling or to open it when desired to establish communication between the drying room and the circulating chamber 14. In drying stains and veneers it is essential that the moisture be held in the drying room in sufficient quantity to permit even drying of the articles without causing them to crack or check and when operating upon articles of this character the ceiling is closed, thus facilitating the circulation to a certain extent and insuring a slow even drying action throughout the room. With the ceiling in closed position the air which has been cooled by the coils 17 is admitted to the drying room beneath the lower edge of the wall 8 and is forced across toward the heating chamber 13. A portion of the air, however, rises in the drying room, passes up the inner face of the wall 9 across the ceiling, down the inner face of the wall 8 and thence across to the heating chamber. The air which enters the heating chamber beneath the lower edge of the wall 9 is heated by the coils 21 and rises to the top of the chamber from whence it passes through the circulating passageway 14 to the cooling chamber. It will thus be manifest that a continuous and uniform circulation of air is maintained. In order that the circulation may be increased, if desired, I have made the lower portion of the wall 9 in sections which are hinged together as shown. The sections 31 in front of the coils 21 may be raised to permit access to the coils when desired. The sections 32 which are hinged to the lower edge of the sections 31 under ordinary conditions assume the position shown in the drawings, the size of the opening between the drying room and the heating chamber being limited by the lower edge of these sections. The upper edge of the opening between the heating chamber and the drying room is disposed at a higher plane than the upper edge of the opening between the cooling chamber and the drying room to facilitate circulation, since it will be obvious that the circulation would be greatly diminished if the opening be-

tween the drying room and the heating chamber were decreased to the size and position of that between the cooling chamber and the drying room. With the parts in the position as shown in the drawings a large proportion of the air admitted to the drying room from the cooling chamber will pass across the room around the articles being dried and directly into the heating chamber, the remaining portion circulating around the upper portion of the room as previously stated. Should it become desirable to increase the circulation in the drying room the sections 32 are raised to thereby increase the size of the openings between the drying room and the heating chamber, thus proportionately increasing the amount of air that will be drawn directly into the heating chamber and correspondingly increasing the circulation.

In drying varnish, enamels, japans, etc., it is desirable that the air circulate with lesser rapidity than is essential or desirable in drying stains, veneers and the like and the room must, in fact, in order to produce the most desirable results, be so regulated that it is, in effect, a baking room. In order to meet this requirement the ceiling is opened by moving the shutters to vertical position as shown in the drawings, thus permitting the air to circulate directly upward in the room. When the drying room is thus utilized a large proportion of the cool air entering the drying room from the cooling chamber 12 rises directly around the articles being dried and passes through the open ceiling to the cooling chamber again. It will be obvious that less air is drawn into the heating chamber from the drying room when the ceiling is opened and that a less rapid circulation will accordingly result. The temperature of the air in the room is, of course, maintained by the heating coils in the heating chamber and a sufficient circulation will be continued to keep the temperature of the drying room uniform throughout. The circulation of air from the drying chamber to the cooling chamber through the circulating passageway will tend to draw the air slowly from the drying room through the ceiling but the rapid circulation which takes place when the ceiling is closed is very materially reduced by opening the ceiling and the room becomes, in effect, as hereinbefore stated, a baking room.

It is believed that my invention and many of its attendant advantages will be understood from the foregoing without further description and it will be obvious that the temperature and humidity of the air in the kiln and also the direction of the air currents and the amount of circulation can be readily and easily controlled.

While I have shown and described in de-

tail the construction of a preferred form of my invention it will be obvious to those skilled in the art that various mechanical variations in the size, shape, proportion and arrangement of the various parts may be resorted to without departing from the spirit of the invention or sacrificing any of the material advantages thereof.

I claim:

1. A drying kiln comprising a drying room, a heating chamber at one side of the room and communicating with the interior of the room near the floor, a cooling chamber at the opposite side of the room and communicating with the interior of the room near the floor thereof, the upper edge of the communication between the drying room and the heating chamber being higher from the floor than the upper edge of the opening between the drying room and the cooling chamber, whereby to facilitate circulation through the room, and means forming a circulating passageway above the ceiling of the room connecting the drying and cooling chambers whereby the air rising in the heating chamber is conveyed above the room to the cooling chamber.

2. A drying kiln comprising a drying room, a heating chamber located at one side of said room and communicating with the interior of said room throughout its length near the floor thereof, a cooling chamber located at the opposite side of the room and also communicating with the interior of the room throughout its length near the floor, and means forming a circulating passageway connecting the heating chamber and the cooling chamber above the ceiling of the room, the upper edge of the opening between the drying room and the heating chamber being disposed in a higher plane than the upper edge of the opening between the room and the cooling chamber whereby to facilitate circulation of the air through the room.

3. A drying kiln comprising a drying room, a heating chamber and a cooling chamber located on opposite sides of the room, the lower edges of the walls between the cooling and heating chambers and the drying room being spaced from the floor to establish communication between the room and the chambers, means for varying the size of the communicating openings between the drying room and heating chamber whereby to regulate the circulation within the room, and means forming a circulating passageway disposed above the ceiling of the drying room and connecting the heating chamber with the cooling chamber.

4. A drying kiln comprising a drying room, a heating chamber and a cooling chamber located at opposite sides of the room and communicating with the interior

of the room near the bottom thereof, means forming a circulating passageway connecting the heating chamber and the cooling chamber above the ceiling of the drying room, heating coils arranged in said drying chamber, and cooling coils arranged in said cooling chamber on a higher plane than said heating coils in the heating chamber whereby a circulation will be maintained due to the difference in weights of the columns of air below the cooling coils and above the heating coils, respectively.

5. A drying kiln comprising a drying room, a heating chamber, a cooling chamber, means forming a circulating passageway connecting said heating and cooling chambers, and adjustable means for establishing communication between the drying room and the circulating passageway.

6. A drying kiln comprising a drying room, a heating chamber located at one side thereof and communicating with the room near the floor, a cooling chamber located at the opposite side of the room and communicating with the interior of the room near the floor, means forming a circulating passageway disposed above the floor and connecting said heating and cooling chambers, and adjustable means for shutting off and establishing at will communication between the top of the drying room and the circulating passageway.

7. A drying kiln comprising a drying room, a cooling chamber communicating with one side of the room near the floor, a heating chamber communicating with the opposite side of the room near the floor, means forming a circulating passageway connecting said chambers above the ceiling of the room, and a series of shutters forming the ceiling of the room and adapted when opened to establish communication between the top of the room and the circulating passageway.

8. A drying kiln comprising a drying room, a heating chamber and a cooling chamber located on opposite sides of the room, the walls dividing said chambers from the room being spaced from the floor to establish communication between said chambers and the room throughout their length, a heating coil arranged in said heating chamber, thermostatic means for controlling the admission of a heating medium to said coils, cooling coils located in the cooling chamber at a higher level than said heating coils, means forming a circulating passageway connecting said heating and cooling chambers above the room, and means for establishing communication between the top of said room and said circulating passageway.

9. A drying kiln comprising a drying room, a heating chamber and a cooling

- chamber located on opposite sides of the room, means forming a circulating passageway connecting said chambers above the room, adjustable shutters forming the ceiling of the room and adapted when open to establish communication between the room and the circulating passageway, the side walls of the room being spaced from the floor to establish communication between the floor and the heating and cooling chambers and the lower portion of the wall between the room and the drying chamber being hinged whereby the size of the communication between the chamber and room may be increased, heating coils disposed in said heating chamber, thermostatically controlled means for regulating the amount of heating medium admitted to said coils, means for admitting moisture into the interior of the room, and cooling coils located in said cooling chamber at a higher level than the heating coils, said parts being constructed and arranged to maintain a circulation of air through the drying room.
10. A drying kiln comprising a drying room, a cooling chamber located at one side of the room, a heating chamber located at the opposite side of the room from the cooling chamber, the separating walls between said heating and cooling chambers and the room being provided with openings, the upper edge of one of said openings being disposed at a higher elevation than the upper edge of the other opening, and means forming a circulating passageway above the ceiling of the room connecting said drying and cooling chambers whereby circulation is maintained.
11. A drying kiln comprising a drying room, a heating chamber located at one side of the room, a cooling chamber located at the opposite side of the room, the lower edges of the walls between the cooling and heating chambers and the drying room being spaced from the floor at different heights to establish communication between the room and the chambers whereby circulation will be maintained due to the difference in weights of the columns of air in the respective chambers, and means forming a circulating passageway disposed above the ceiling of the drying room and connecting said heating and cooling chambers.
12. A drying kiln comprising a drying room, a heating chamber and a cooling chamber located at opposite upright sides of said room and communicating with the interior of the room near the bottom thereof, a passageway above said drying room, connecting said heating chamber and said cooling chamber and providing communication therebetween outside of said drying room, said passageway being free from obstructions tending to retard the flow of air therethrough, heating coils in said heating chamber, and cooling coils in said cooling chamber.
13. A drying kiln comprising a drying room, a heating chamber and a cooling chamber located at opposite upright sides of the room and communicating with the room near the bottom thereof, a passageway above said drying room connecting said heating chamber and said cooling chamber and providing communication therebetween outside of said drying room, said passageway having controllable means for establishing direct communication between said drying room and said passageway, heating means in the heating chamber, and cooling means in the cooling chamber.
14. A drying kiln comprising a drying room, a heating chamber at one upright side thereof, a cooling chamber at another upright side thereof and communicating near its bottom with the drying room, a circulating passageway above the room, connecting the heating chamber and the cooling chamber, and provided with means to establish and cut off communication between said drying room and passageway, heating means in the heating chamber, and cooling means in the cooling chamber.
15. A drying kiln comprising a drying room, a heating chamber located at one of the upright sides of the said room and communicating with the room near the floor thereof, a cooling chamber located at another upright side of the room and communicating with the room near the floor thereof, a passageway connecting the upper ends of said chambers outside of the drying room, said passageway being free from obstructions tending to retard the flow of air therethrough, heating means in the heating chamber to cause an upward flow of air in said chamber, and cooling means located within the cooling chamber and beneath its upper end for producing a downward flow of air in the cooling chamber.
16. A drying kiln comprising top, bottom and side walls, a partition spaced from one side wall and having its top disposed a substantial distance beneath said top wall, heating means located between said partition and its adjacent side wall, a second imperforate partition spaced from the opposite side wall and having its top disposed a substantial distance beneath said top wall, and cooling means located between said last named partition and its adjacent side wall, the lower edges of said partitions being spaced from the floor of the drying room to permit a flow of air from the cooling means into the drying room and from the drying room to the heating means.
17. A drying kiln comprising a top, bottom and upright side walls, an upright par-

3 tition spaced from one upright side wall and having its top disposed a substantial distance beneath said top wall, heating means disposed between said partition and the adjacent side wall to cause an upflow of air behind said partition, and a cooling coil having the individual coils thereof supported one above the other adjacent to the upright side wall opposite said heating

means whereby a downflow of air is caused 10 in the kiln on the opposite side of the kiln from the upflow caused by the heating means.

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