H. E. HOLLISTER.

APPARATUS FOR DRYING MATERIALS.

APPLICATION FILED JULY 17, 1917.

1,304,182.

Patented May 20, 1919.

3 SHEETS—SHEET 1.

Fig: 1.

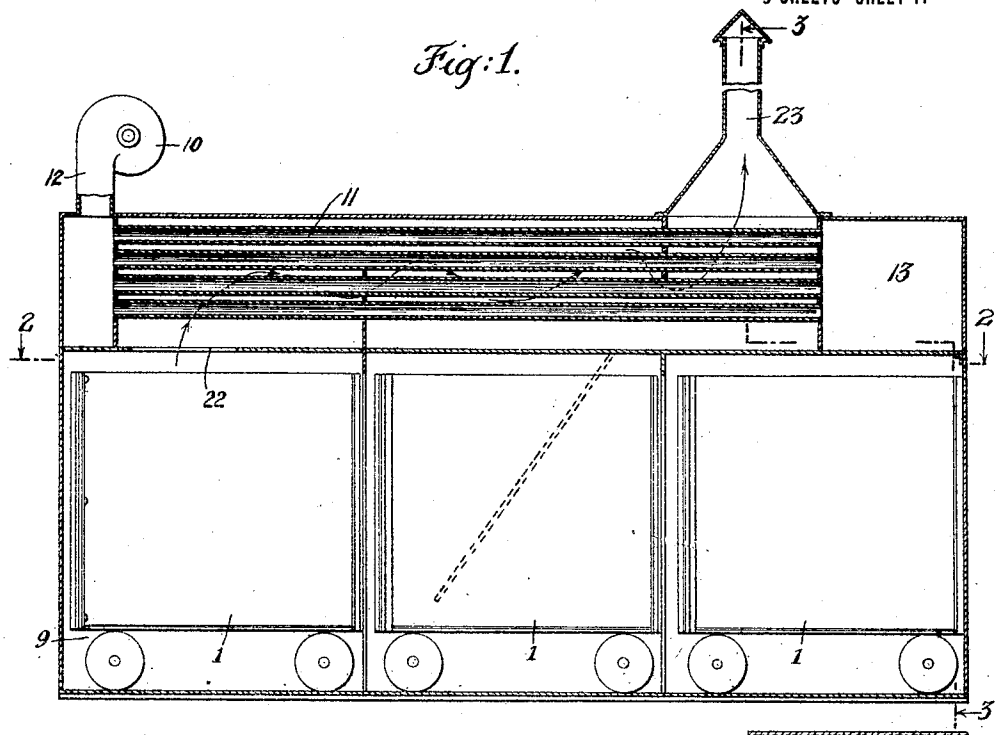
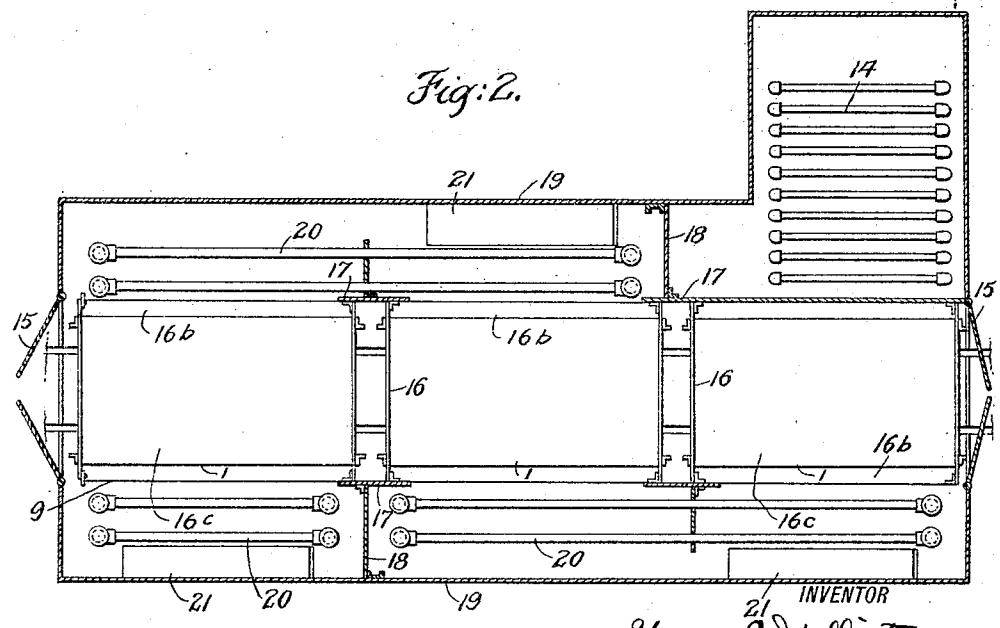


Fig: 2.



INVENTOR

Harry E. Hollister,

BY

Rindle, Wright & Small,

ATTORNEYS

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

H. E. HOLLISTER.

APPARATUS FOR DRYING MATERIALS.

APPLICATION FILED JULY 17, 1917.

1,304,182.

Patented May 20, 1919.

3 SHEETS—SHEET 2.

Fig: 3.

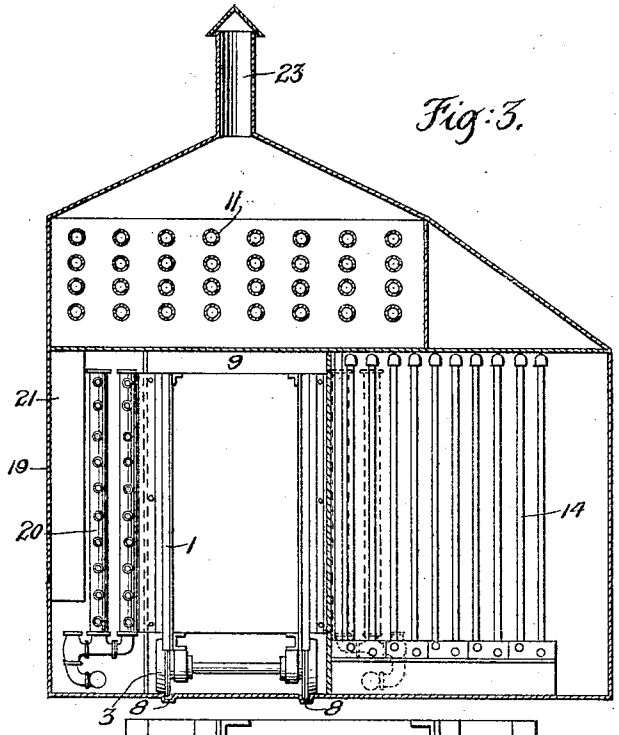
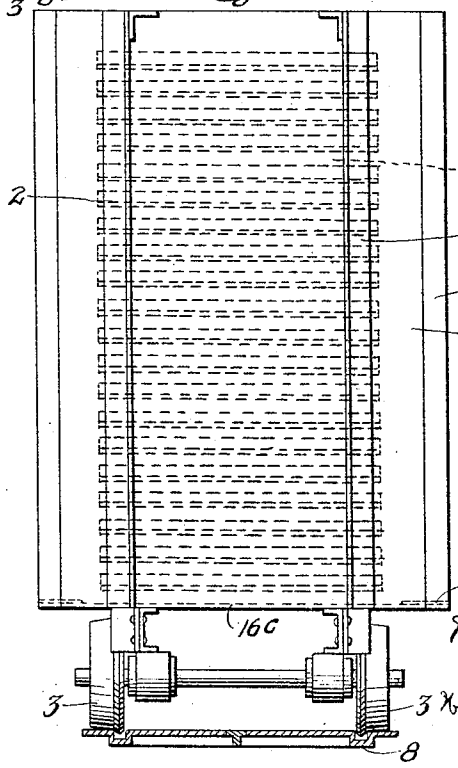


Fig: 5.



INVENTOR

Harry E. Hollister,

BY Prindle Wright & Small

ATTORNEYS.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

H. E. HOLLISTER.

APPARATUS FOR DRYING MATERIALS.

APPLICATION FILED JULY 17, 1917.

1,304,182.

Patented May 20, 1919.

3 SHEETS—SHEET 3.

Fig: 6.

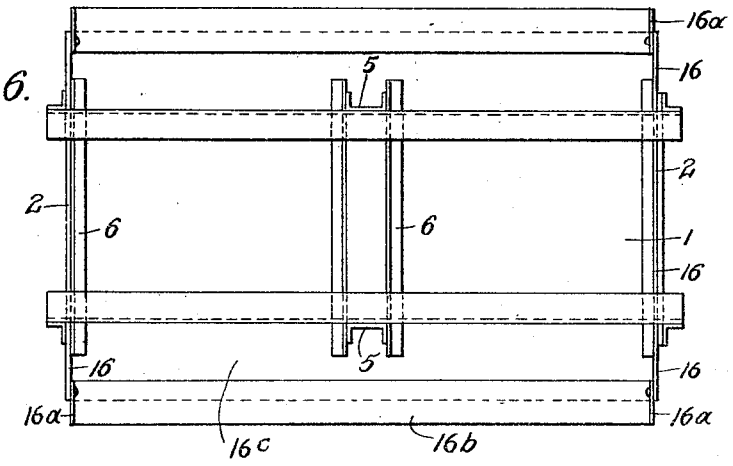
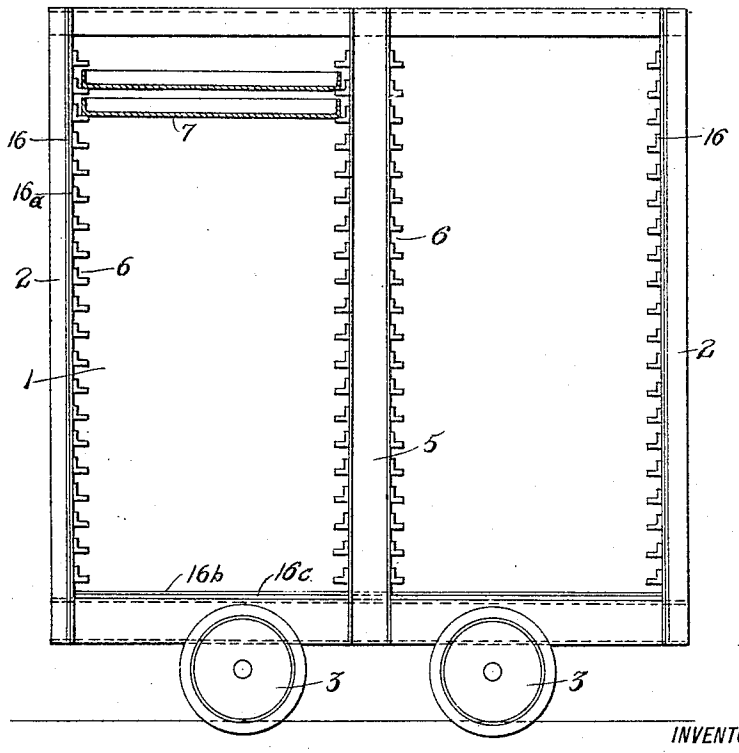


Fig: 4.



INVENTOR

Harry E. Hollister

BY

Prindle, Wright & Small,

ATTORNEYS

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HARRY E. HOLLISTER, OF IRVINGTON, NEW JERSEY, ASSIGNOR TO KALBPERRY CORPORATION, OF ELIZABETH, NEW JERSEY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR DRYING MATERIALS.

1,304,182. Specification of Letters Patent. Patented May 20, 1919.

Application filed July 17, 1917. Serial No. 180,984.

To all whom it may concern:

Be it known that I, HARRY E. HOLLISTER, of Irvington, in the county of Essex, and in the State of New Jersey, have invented a certain new and useful Improvement in Apparatus for Drying Materials, and do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention has been to provide a method of and apparatus for drying materials which shall have, among others, the advantage of enabling the materials to be placed upon cars, so as to be conveniently handled, and yet of securing a very efficient drying, both as to time and cost of fuel, and to such ends my invention consists in the method of and apparatus for drying materials hereinafter specified.

In the accompanying drawings—

Figure 1 is a vertical, longitudinal, sectional view of a drier embodying my invention, the view being more or less diagrammatic;

Fig. 2 is a plan view partly in section taken on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal, sectional view of Fig. 1 on the line 3—3;

Fig. 4 is a side elevation of a car adapted for use in the drier of Fig. 1;

Fig. 5 is an end view of Fig. 4; and

Fig. 6 is a plan view of Fig. 4.

The heater shown in the accompanying drawings is the best embodiment of my invention known to me, but as my invention is capable of embodiment in many different forms, the illustrated embodiment is to be regarded as typical only of many possible embodiments, and my invention is not to be confined thereto.

The heater which is the subject of the present application is another embodiment of my invention forming the subject of my application for patent for method of and apparatus for drying materials, Serial No. 180,983, filed July 17, 1917, to which application reference is made for claims for broad ideas common to the two applications.

In the heater which is the subject of the accompanying drawings, the materials to be dried are placed upon cars 1, and preferably upon trays carried by the cars. Said cars, as illustrated, consist of a framework 2 mounted upon axles carried by wheels 3, and such framework, as illustrated, has two pairs of upright angle-irons, one pair at each end, and channel beams 5 in the middle, which are connected by horizontal bracing at the top. This framework carries two sets of slides or ways 6, which, in the present instance, are shown as angle-irons, for supporting two stacks of trays 7, and the material to be dried is placed on said trays. The cars are mounted on tracks 8, which run into a housing 9 in the form of a tunnel. Air for drying is introduced into the housing by any desired means which, in the present instance, is shown as consisting of a fan or blower 10 mounted on the roof of the housing. The air first enters an economizer or preheater 11 which, in the present instance, is shown as mounted on the roof of the housing. The economizer is shown as consisting of flues or pipes having their rear ends opening into the duct from the fan 10, and having their forward ends opening into a duct 13 which opens into a heater 14. This heater, as illustrated, consists of coils of pipe inclosed within the housing. After passing through the heater, the air enters the tunnel proper, or passage where the car stands, for drying. The tunnel is provided with doors 15 at each end, which may be opened to admit cars and closed while the drying operation is being performed. In order to cause the air to pass efficiently through the stacks of trays on each car, I provide each car with a plate or baffle 16 at each end of the car, although the result can be obtained by a single plate or baffle on each car. At intervals in the tunnel I place vertical plates 17 parallel with the track, and in such position that each such plate shall be opposite a baffle on each car and preferably shall be opposite and close to the edges of the baffles on the adjacent ends of two cars. In order to make a tight connection between the plates 17 and the baffles on the cars, I preferably provide each baffle with a wiper 16^a. I also preferably provide a wiper 16^b at each edge of the bottom plate 16^c of each car. Each alternate plate 17 is connected by a plate 18 with the outer wall 19 of the housing, the plate 18, for instance, nearest the right-hand or upper end of the tunnel being on the upper side of Fig. 2, and the corresponding plate on the lower side of the said figure. Heaters, in the form of coils 20, are placed beside each car station, and preferably on each side of each car station. Between each coil 20 and the outer wall 19, I preferably

place a diagonal baffle 21. At the rear end of the tunnel is a port 22 opening from the rear end of the tunnel into the space outside the economizer tubes, so that, as later described, the exhaust air passes through the economizer, outside the economizer tubes, and thence forward and up out of a stack 23 to the atmosphere.

In the practice of my method by the apparatus which I have described, the material to be dried is placed upon trays which are mounted on the angle-irons or slides 6 on the cars, so that each car has two vertical stacks of trays, and the trays are spaced apart so that air can flow over the surface of the material on each tray. The cold air is drawn from the atmosphere by the fan and forced through the economizer tubes, taking up the heat transferred to said tubes by the exhaust air passing along outside of the tubes. The incoming air, after passing through the economizer tubes, passes through the duct 13 and into the heater 14, and thence into the tunnel. The air enters the side of the tunnel from the heater (the farther side, as seen in Fig. 2), and passes horizontally through the stacks of trays of the first car to the opposite side of the tunnel, the baffle plates compelling the air to follow this course. The air then passes through the first heater coil 20, thence between the first plate 18 and the tunnel wall, and through the next heater coil, and horizontally through the stacks of trays of the second car, crossing the tunnel to the opposite side. In order to insure that the hot air shall not remain in the upper part of the tunnel, but shall mix with the cooler air at lower levels, the inclined baffle 21 is provided in the space between the coils 20 and the outer wall 19 of the tunnel, as before described, the said baffle compelling the air to descend before it can pass underneath the lower end of the baffle. The plate 18, together with the plate 17 and the wiper and baffle 16, prevent the air from passing along the tunnel so that it is compelled to pass through the stacks of trays as stated. In this manner, the air passes from the heater horizontally across the tunnel through the first car and stacks of trays, and then forward and horizontally across the tunnel in the opposite direction through the second car and stacks of trays, and so on down the tunnel. Each time the air passes to a car its temperature is restored, preferably to the original temperature at which it left the heater, by the coils 20 beside each car station. When the air has passed through the last car, it enters the economizer through the opening 22 and gives up its heat to the outer surfaces of the tubes in the economizers, and finally passes out the stack 23 with comparatively little waste heat. Not only do the coils at the sides of the cars heat the air, but they heat the materials on the cars by direct radiation, thus greatly aiding in driving off the moisture. To increase this effect, the coils are placed close to the cars. For accomplishing this function, it is not necessary that the coils be placed at the sides of the cars, but any other position of close proximity would do.

With my heater the material placed upon the trays can be brought to the heater upon the cars, and without being unloaded in any manner, pass through the drying operation and be conveyed away to the place where the dried material is to be used or packed, with a minimum of handling. Because the air is at all times at the most advantageous temperature, and because the material in the cars is heated by the coils at the sides of the cars, the drying operation is performed at the most efficient temperature and with great economy of time and fuel.

I claim:

1. The combination of a tunnel, a series of cars adapted to be placed in said tunnel, transverse partitions between said cars, partitions between the car partitions and the tunnel walls arranged to form a continuous air passage leading through the cars successively in opposite directions transversely of the tunnel, means to force heated air through said passage, and means for preventing formation of strata of cold and warm air in said passage.

2. The combination of a tunnel, a series of cars adapted to be placed in said tunnel, transverse partitions between the cars, partitions between the car partitions and the tunnel walls arranged to form a continuous air passage leading through the cars successively in opposite directions transversely of the tunnel, means to force heated air through said air passage, means for reheating the air at intervals throughout its passage, and means for preventing formation of strata of cold and warm air in said passage.

3. The combination of a tunnel, a series of cars adapted to be placed therein, means for causing the air to pass successively through each of said cars horizontally, means for heating the air at intervals during said passage, and an economizer adapted to transfer heat of the exhaust air to the incoming air.

4. The combination of a tunnel, a series of cars each having a transverse partition or baffle, partitions in said tunnel adapted to close the space between a car baffle and the tunnel wall, said partitions being placed alternately upon opposite sides of the tunnel, and means disposed between said tunnel partitions for preventing the formation of strata of cold and warm air in said tunnel.

5. The combination of a tunnel, a series of cars each having a transverse partition or baffle, partitions in said tunnel adapted to

close the space between a car baffle and the tunnel wall, said partitions being placed alternately upon opposite sides of the tunnel, a heater adapted to heat the air entering the tunnel, and heaters placed at intervals in the tunnel in the path of said air.

6. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffles, and partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel.

7. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffles, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, and wipers adapted to form a close contact between said car baffles and said plates.

8. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffles, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, a heater adapted to heat air entering the tunnel, and a heater near each car station.

9. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffles, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, wipers adapted to form a close contact between said car baffles and said plates, a heater adapted to heat air entering the tunnel, and a heater near each car station.

10. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffles, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, and baffles downwardly inclined in the direction of travel of the air to cause a mixing of the hot air in the upper part of the tunnel with the cooler air at lower levels.

11. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffles, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, wipers adapted to form a close contact between said car baffles and said plates, and baffles downwardly inclined in the direction of travel of the air to cause a mixing of the hot air in the upper part of the tunnel with the cooler air at lower levels.

12. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffles, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, a heater adapted to heat air entering the tunnel, and a heater near each car station, and baffles downwardly inclined in the direction of travel of the air to cause a mixing of the hot air in the upper part of the tunnel with the cooler air at lower levels.

13. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffles, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, wipers adapted to form a close contact between said car baffles and said plates, a heater adapted to heat air entering the tunnel, a heater near each car station, and baffles downwardly inclined in the direction of travel of the air to cause a mixing of the hot air in the upper part of the tunnel with the cooler air at lower levels.

14. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffle, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, a heater adapted to heat air entering the tunnel, a heater near each car station, and an economizer or preheater adapted to transfer the heat of the exhaust air to the incoming air.

15. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffle, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, wipers adapted to form a close contact between said car baffles and said plates, a heater adapted to heat air entering the tunnel, a heater near each car station, and an economizer or preheater adapted to transfer the heat of the exhaust air to the incoming air.

16. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffle, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, baffles downwardly inclined in the direction of travel of the air to cause a mixing of the hot air in the upper part of the tunnel with the cooler air at lower levels, and an economizer or preheater adapted to transfer the heat of the exhaust air to the incoming air.

17. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffle, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, wipers adapted to form a close contact between said car baffles and said plates, baffles downwardly inclined in the direction of travel of the air to cause a mixing of the hot air in the upper part of the tunnel with the cooler air at lower levels, and an economizer or preheater adapted to transfer the heat of the exhaust air to the incoming air.

18. The combination of a series of cars each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffle, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, a heater adapted to heat air entering the tunnel, a heater near each car station, baffles downwardly inclined in the direction of travel of the air to cause a mixing of the hot air in the upper part of the tunnel with the cooler air at lower levels, and an economizer or preheater adapted to transfer the heat of the exhaust air to the incoming air.

19. The combination of a series of cars, each having a baffle or partition thereon extending transversely, a tunnel having a track therefor, plates parallel to said track and adapted to contact with said car baffle, partitions connecting said plates with said tunnel walls, said partitions being placed alternately upon opposite sides of the tunnel, wipers adapted to form a close contact between said car baffles and said plates, a heater adapted to heat air entering the tunnel, a heater near each car station, baffles downwardly inclined in the direction of travel of the air to cause a mixing of the hot air in the upper part of the tunnel with the cooler air at lower levels, and an economizer or preheater adapted to transfer the heat of the exhaust air to the incoming air.

20. A heater comprising the combination of cars adapted to carry material to be dried, a tunnel, means for causing heated air to pass in contact with the material carried by each of said cars transversely to the track, and successively in opposite directions, and means for heating the material on the cars by direct radiation.

21. A heater comprising the combination of cars adapted to carry material to be dried, a tunnel, means for causing heated air to pass in contact with the material carried by each of said cars transversely to the track, and successively in opposite directions, means for reheating the air at intervals during said passage, and for heating the material by direct radiation.

22. A heater comprising the combination of cars adapted to carry material to be dried, a tunnel, means for causing heated air to pass in contact with the material carried by each of said cars, transversely to the track, and successively in opposite directions, means for reheating the air at intervals during said passage, and for heating the material by direct radiation, and means for causing the hotter portions of the air to mix with colder portions.

23. A heater comprising the combination of cars adapted to carry material to be dried in layers at different levels, a tunnel, means for causing heated air to pass in contact with the material carried by each of said cars, transversely to the track, and successively in opposite directions, and means for heating the material by direct radiation.

24. A heater comprising the combination of cars adapted to carry material to be dried in layers at different levels, a tunnel, means for causing heated air to pass in contact with the material carried by each of said cars, transversely to the track, and successively in opposite directions, means for reheating the air at intervals during said passage, and means for heating the material by direct radiation.

25. A heater comprising the combination of cars adapted to carry material to be dried in vertical stacks of trays, a tunnel, means for causing heated air to pass over the material carried by each of said cars, transversely to the track, and successively in opposite directions, means for reheating the air at intervals during said passage, and means for heating the material by direct radiation.

26. A heater comprising the combination of cars adapted to carry material to be dried in vertical stacks of trays, a tunnel, means for causing heated air to pass over the material carried by each of said cars, transversely to the track, and successively in opposite directions, means for reheating the air at intervals during said passage and for heating the material by direct radiation, and means for causing the hotter portions of the air to mix with colder portions.

27. The combination of a tunnel, a series of cars adapted to be placed therein, means for causing the air to pass successively through each of said cars horizontally, and means for heating the air at intervals during said passage, and for heating the material by direct radiation.

28. The combination of a tunnel, a series of cars adapted to be placed therein, means for causing the air to pass successively through each of said cars horizontally, means for heating the air at intervals during said passage, and for heating the material by direct radiation, and an economizer adapted to transfer heat of the exhaust air to the incoming air.

29. The combination of a tunnel, a series of cars each having a transverse partition or baffle, partitions in said tunnel adapted to close the space between a car baffle and the tunnel wall, said partitions being placed alternately upon opposite sides of the tunnel, a heater adapted to heat the air entering the tunnel, and heaters placed at intervals in the tunnel in the path of said air and close to the cars.

30. The combination of a tunnel, a series of cars each having a transverse partition or baffle, partitions in said tunnel adapted to close the space between the car baffle and the tunnel wall, said partitions being placed alternately upon opposite sides of the tunnel wall, a heater adapted to heat the air entering the tunnel, and heaters placed close to the car positions.

In testimony that I claim the foregoing I have hereunto set my hand.

HARRY E. HOLLISTER.

Witnesses:
H. S. THOMPSON,
PAUL W. WEBSTER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."