Sept. 4, 1928.

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G. D. HARRIS

METHOD OF CONDITIONING COATED MATERIALS

Filed Jan. 27, 1925

3 Sheets-Sheet 1

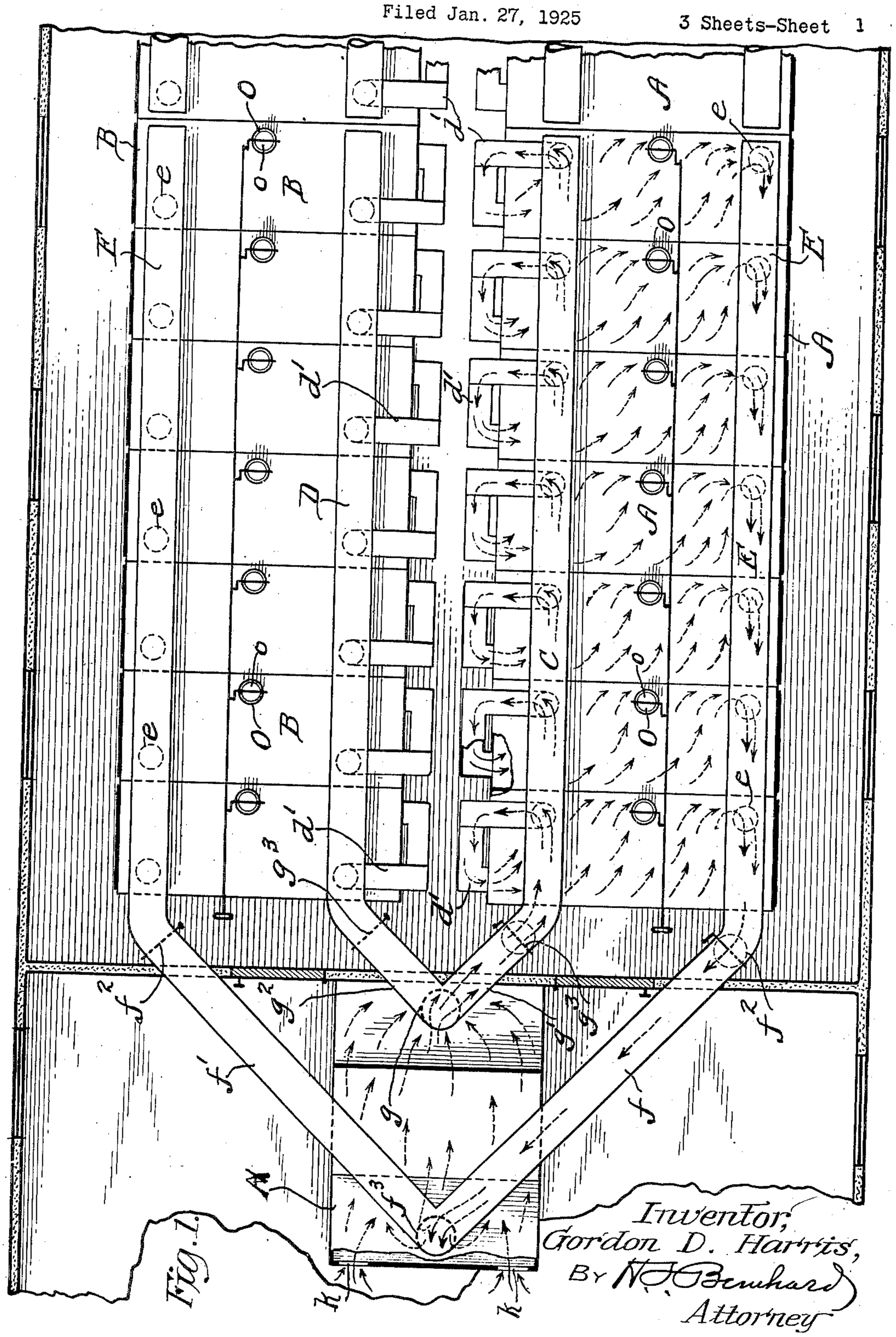

Fig. 1.

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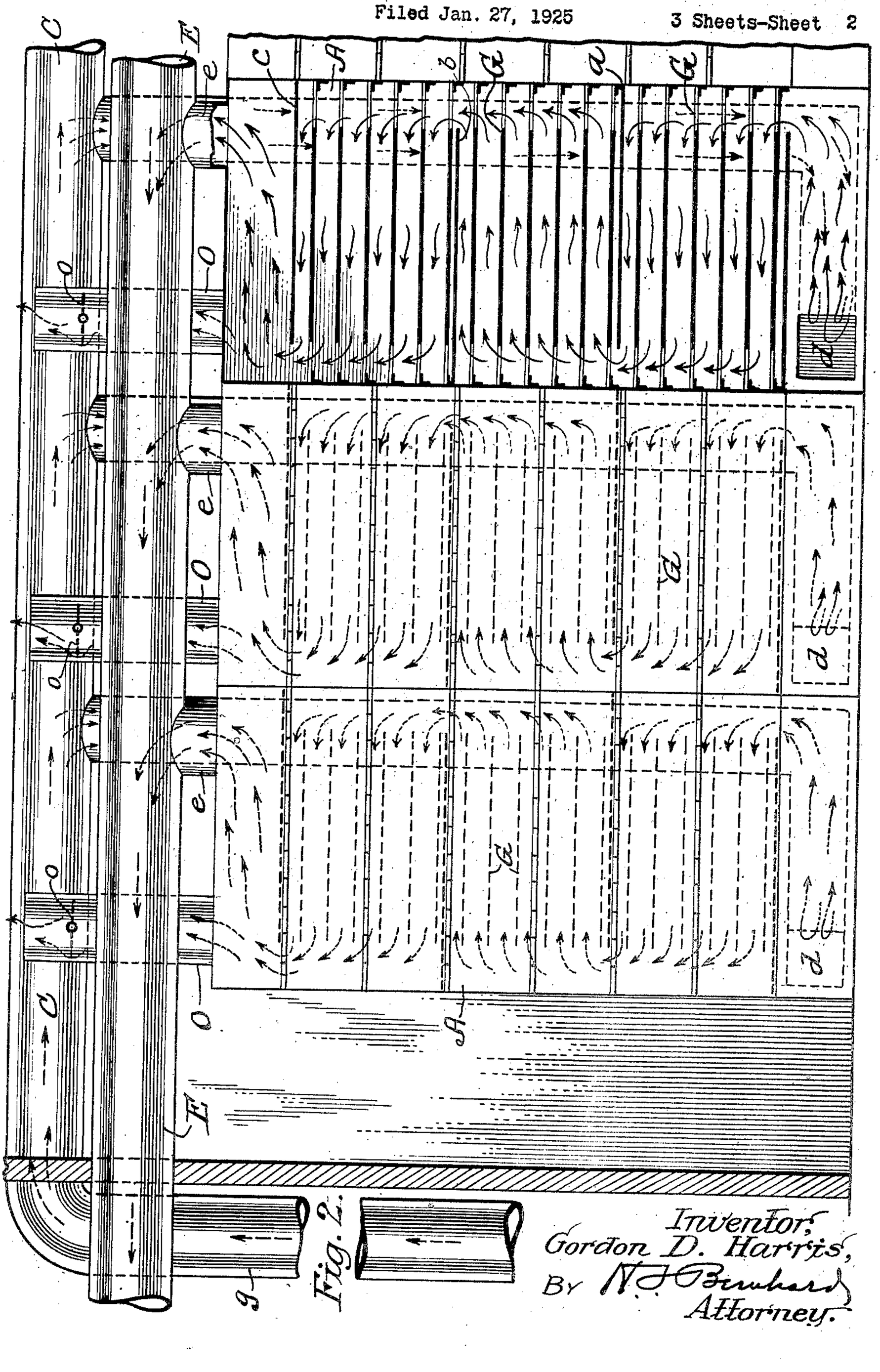

Fig. 2.

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3 Sheets-Sheet 3

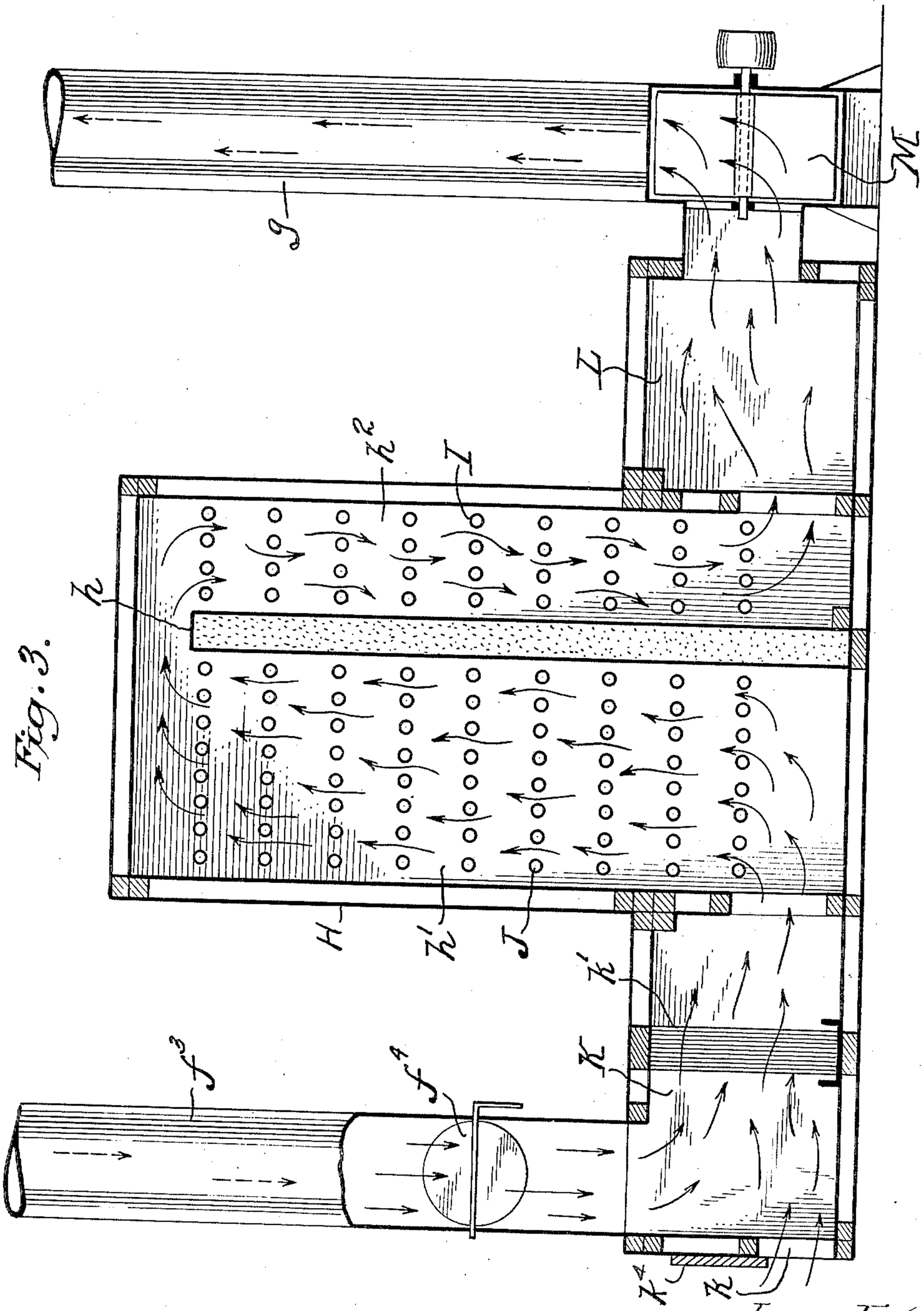

Fig. 3.

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Patented Sept. 4, 1928. 1,682,752

UNITED STATES PATENT OFFICE.

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METHOD OF CONDITIONING COATED MATERIALS.

Application filed January 27, 1925. Serial No. 5,036.

This invention pertains to the art of conditioning coated materials, the same being useful, more particularly, in the oxidation of the coating or coatings usually applied to the surfaces of hides and skins, and other sheet materials, for imparting to such sheet material a desirable finishing coating, as in the case of patent leathers.

Although my invention is useful in conditioning coated sheet materials generally, it is well adapted for oxidizing the coatings on the product known usually as patent leather, the same comprising a basic layer, usually a hide or skin, on one surface of which is applied an under coating whereon is applied a second coating referred to usually as a top or finishing coating. It is the top or finishing coating that determines the quality of the product, and it is the coating which demands and receives ordinarily the closest attention in the manufacture of the product, for the reason stated, i. e. quality, and for the further reason that the oxidation of the top or finish coat is attended ordinarily with the greatest difficulty because of the uncertainty that prevails in effecting the complete oxidation of such top coat with a view to eliminating the "tackiness" or adhesive surface of said top dressing or coating.

The procedure ordinarily followed in the commercial production of patent leather is to apply an under coat to one surface of the hide or skin, to thereafter apply to the under coat a second or top coating, and to bake the coated material in ovens in the presence of a relatively still or non-moving atmosphere for a period of eighteen (18) to thirty (30) hours, after which the coated material is removed from the oven and carried into the open air for exposure to the weather and to the sun's rays in order to complete the operation of oxidizing and finishing the coatings, more particularly that top coating. Upon the removal of the hides from the oven, the top coatings thereon have a certain amount of "tack" or stickiness, and it is the exposure to the sun's rays or to weather conditions that is presumed to complete the conditioning operation and to remove the final "tack" or stickiness. However, after the hides are brought in from the field following such exposure, and are finally passed as thoroughly finished and are shipped from the factory to the consumer, it frequently happens that the "tack" or sticky condition returns to the top coating, with the result that the hides are adhesively attached and the coatings destroyed so as to be unfit for manufacturing purposes.

The object of my invention is to eliminate the uncertainty in the operation of conditioning the coating on the surface of the basic material to obviate the requirement of exposure to the sun's rays or to the weather for oxidizing the top coating, to produce a superior product the top coating of which is completely oxidized so as to be in a relatively dry and non-adhesive condition to allow the products to be superposed and packed without running the risk of becoming adhesively attached, and to attain economy of time and labor in the production of the completed articles.

Instead of the two step process ordinarily followed in first baking the coating and in subsequently exposing the baked product to the weather or the sun's rays, my invention in the process and apparatus involves the step of positioning the coated materials within a chamber wherein such coated materials remain from the first stage to the finishing stage, thus obviating the requirement of the ordinary procedure of removing the materials from the ovens to the field and attaining economy of labor in the handling of the products.

My invention includes, further, the step of conditioning the coated materials while in the chamber by recirculating a moving body of an oxidizing agent, usually atmospheric air possessing a given temperature and humidity, into contact with the coated surfaces of the products, in contradistinction to the step of baking the coated materials with ovens and in the presence of a still non-flowing atmosphere. According to my invention, the volume, velocity and path of movement of the oxidizing atmosphere is determined and controlled so as to direct the atmosphere into contact with the coated surfaces of the products for effecting the oxidation of such coatings, and, further, the oxidizing atmosphere is not only recirculated into repeated contact with the coated surfaces, but such oxidizing atmosphere is heated to a determined temperature so as to effect the "baking oxidization" of the coatings, and, again, such oxidizing atmosphere is itself reconditioned during the cycles of its recirculation by replacing a given volume of such atmosphere with an equal volume of fresh

(new) atmospheric air, the oxygen in which combines with the materials present within the coatings for effecting the oxidation thereof.

My invention involves the further step of conditioning the materials while within the chamber, i. e. without removing the same from the chamber or handling said materials, by circulating fresh atmospheric air into contact with the coated surfaces of said materials, this step of flowing fresh conditioned atmospheric air into contact with the coated surfaces taking place subsequently to the initial conditioning by two repeated circulations of more or less humid and heated oxidizings atmosphere first referred to, and the second flowing of such fresh conditioned atmospheric air operating to carry to the coated surfaces the oxygen which is required to effect the complete oxidation of the coatings and particularly the top finishing or dressing coating so as to not only completely oxidize the coatings, but to eliminate the tacky or adhesive surface of the top coating. By flowing fresh conditioned atmospheric air into contact with the coated surfaces subsequently to the baking oxidizing operation, I am enabled to supply the oxygen required to combine or unite with the materials of the coating or coatings to form a compound and attain oxidization which completely penetrates the coatings and produce a thoroughly dry and finished coated surface free from the objectionable tack or stickiness. The new air admitted supplies oxygen in relation to oxidation, and this flowing of new conditioned air continues while the materials are present within the chamber and until the top coatings on the materials are practically and uniformly oxidized, the term uniformly as herein used meaning that the coatings, including the top coating, are oxidized from top to bottom or from the outside to the hide, that no film or skin is formed, and that the oxidization penetrates the body of the coating from exposed surface to the skin and is lacking in tack or stickiness.

My process obviates the requirement for removing the hides from the oven to the open field and exposing such hides to the sun or the weather, but, on the contrary, the hides remain within the chamber and they are subjected first to the action of a conditioned and heated air which is recirculated, heated and conditioned by the addition of fresh atmospheric air for oxidizing the coatings to a certain stage, and thereafter while the hides are within the chamber, they are again exposed to a full volume of fresh conditioned atmospheric air which flows into, through, and is discharged from the chamber and into contact with the hides without recirculation so as to subject the hides to an improved treatment which completes the oxidation thereof and eliminates the tack and stickiness. This second stage in the oxidation of the hides corresponds, in a way, to the "sunning" step of the commercial treatment, although such second stage of my process is more effective and economical for the reason, mainly, that the oxidation of the coatings is completely performed and the tack or stickiness eliminated.

My process of conditioning coated materials is carried into practice by appropriate mechanism, a preferred form of which is shown in the accompanying drawings, wherein—

Figure 1 is a plan view of an apparatus with multiple treating chambers associated with an air conditioner and suitable circulating flues or ducts.

Figure 2 is a side elevation, with one of said chambers in vertical section.

Figure 3 is a vertical section through the conditioner for the oxidizing atmosphere and for the fresh air atmosphere.

As shown in Figures 1 and 2, the apparatus includes a number of treating chambers arranged in rows at A, B, there being a desired number of such chambers in the row A and a corresponding number of chambers in the row B. The rows of chambers A, B, are positioned in side by side relation for compactness of installation, and with said chambers are associated the feed ducts or flues C, D, and the return ducts or flues E, F, presently described more fully.

Each chamber A or B is constructed with horizontal baffles, *a*, *b*, *c*, see Figure 2, arranged in staggered order to produce within each chamber a zig-zag flow channel, within which flow channel is positioned a series of horizontal racks G, each adapted for carrying or supporting a hide or skin having the coating or coatings applied to the surface thereof. The racks G are or may be of any approved construction, and supported within the flow channel by approved means so as to space the racks and their loads in parallel relation, and thus provide for the free flow of the oxidizing atmosphere or the fresh air atmosphere into the desired contact with the coated surfaces of the skins.

At the bottom of each chamber A or B is an intake port *d*, to which is connected a branch feed pipe *d'* leading upwardly to the feed ducts or flues C or D.

Connected to the upper part of each chamber A or B is a branch eduction pipe *e* having direct communication with said chamber above the racks G therein, said branch pipe *e* being attached to one of the eduction pipes or flues E or F, see Figures 1 and 2, whereby the atmosphere may flow out of the chambers A or B into the return flues or ducts E, F. H is a conditioner shown in Figure 3 for the atmosphere which is to be conditioned and recirculated at one stage of the treatment,

and this conditioner is adapted for use, also, in conditioning the air which is supplied at the second stage of the treatment for completing the oxidizing treatment and eliminating the tacky or sticky surface of the coated material, the latter remaining at rest within the chambers A or B during the first and second stages of such treatment. The conditioner embodies a vertical chambered casing divided by an insulated division wall *h* into a plurality of compartment *h' h²* connected at the top for the free flow of the atmosphere from one compartment to the other. Within one compartment, as *h'*, is positioned a heater I, shown herein as steam coils, whereas in the other compartment, as *h²*, is a cooler and condenser, shown as cooling coils J, each coil I or J having a suitable valve (not shown) for bringing the coil into or out of service as required. At one side of the conditioner is an intake flue or chamber K provided with an inlet *k* for atmospheric air, said inlet being controlled by a gate *k⁴*, and within said chamber K is an air filter *k'* of any approved construction. The return flues or ducts E, F, have converging branch pipes *f*, *f'* each provided with a damper *f²*, and these branch pipes are connected to a vertically positioned pipe *f³* having a damper *f⁴* the lower end of which pipe *f³* is attached to the chamber K, see Figures 1 and 3, whereby the atmosphere flowing out of the chambers A, B, passes through the flues E, F, their branches *f f' f³* and chamber K back to the conditioner H.

On the opposite side of the conditioner H from the intake chamber K is a feed chamber L having direct connection with the eye or intake of a fan, blower, or exhauster M, and to the outlet from this blower or exhauster is connected a vertical branch *g* the upper end of which is attached to inclined branch pipes *g' g²* connected to the distributing flues or ducts C, D, said branch pipes *g' g²* having dampers *g³* adapted to be operated for opening or closing the communications between the feed ducts C, D, and the exhauster M and conditioner H.

The chambers A, B, ducts C, D, E, F, their branches and the conditioner H constitute a closed circulatory path through which an oxidizing atmosphere is adapted to be circulated and recirculated by the action of the blower or exhauster M, for the treatment of the coated surfaces of the material carried by the racks G within the chambers A, B, according to the first stage of my process. During the cycle of circulations, this atmosphere is heated to a desired temperature by flowing into contact with the heating coils I, and the atmosphere is conditioned by the admixture therewith of fresh atmospheric air admitted through the gate controlled inlet *k*.

Leading from each chamber A or B is a discharge pipe O shown as extending upwardly from the chamber and affording means for the delivery directly from said chamber of air the volume of which is controllable by the adjustment of a damper or valve *o*.

By closing the valve to the heating coil I, the latter is out of service and by opening the valve to the cooling and condensing coil J, the latter is brought into service. Now by closing the damper *f⁴* in the branch pipe *f³* leading from the return ducts or flues E F, by closing the dampers *f²* in said ducts E F, and opening the dampers *o* in the discharge pipes O, with the dampers *g³* open in the feed ducts or pipes C, D, and with the damper or gate open in the fresh air inlet *k*, the blower M acts to draw fresh atmospheric air through intake *k*, chamber K, filter *k'*, the compartments *h' h²* of the conditioner, into contact with cooling coil J, and to blow fresh cool atmospheric air through pipes *g*, *g'*, *g²*, and feed ducts C D, thence by pipes *d'* into the chambers A B, through which such cool fresh air flows into contact with the material on the racks G and finds an exit through pipes O to the outer air without recirculating through the apparatus.

The mode of operation for the treatment of coated materials will be apparent from the foregoing description. The racks G loaded with the coated materials are introduced within the chambers A B, and the heater I is in service. The blower or exhauster M circulates an oxidizing atmosphere within the closed circulatory path which includes the chambers A B, and such atmosphere is controlled and directed to flow into contact with the coated surfaces of the materials on said racks whereby said coated surfaces are oxidized. The atmosphere is circulated repeatedly within said closed circulatory path and for the period of time required for the first stage of the treatment and during the cycle of operations, the atmosphere is reheated by coils I to restore the heat units lost from the atmosphere by reason of the contacts with the material, and furthermore, such atmosphere is in part discharged through the dampered outlets O and is conditioned by admixture with fresh atmospheric air admitted in regulated volumes through the gate controlled intake *k*.

In my two-stage treatment of the coated surfaces of materials such as patent leather, the first stage involves the recirculation for a desirable period of time of an oxidizing atmosphere into repeated contacts with the coated surfaces to the end that at least two desirable conditions will result, one of which conditions is that the oxidizing atmosphere becomes charged with the volatile vapors emanating from the coatings and

the oxidation of such coatings is carried on continuously during the cycles of such recirculation whereby the volatiles present in the flowing atmosphere are brought into contacts with the coatings. The oxidation of such coatings will be carried on in the presence of the volatiles carried in the atmosphere, the effect of which is that the coatings remain in a softened condition at and during the oxidizing stage, and thus the treatment continues for that period of time required for the coating to become oxidized throughout the depth of the coating, from the exposed surface to the hide. By recirculating an atmosphere surcharged with volatiles for the charged atmosphere to contact repeatedly with the coatings, the coating remains in a softened condition, free from the tendency to dry on the surface and produce a crust or film on such surface, the presence of which film is disadvantageous by reason of a tendency to preclude the exudation of the volatiles present in the coating, and thus the oxygen present in the atmosphere is free to combine with certain constituents of the coating in a manner to attain oxidation of the coating throughout its depth. At this first stage of the oxidation, the condenser I is out of service to the end that the cold surfaces thereof will not tend to condense the volatiles which it is desired to retain in the flowing atmosphere for the described repeated contacts with the coatings, but it is desirable to keep the heater J in service during such cycles of recirculation of the atmosphere for the maintenance of the atmosphere at the desired temperature.

Furthermore, in the first stage of recirculating an oxidizing atmosphere surcharged with volatiles from the coatings, the air inlet valve *k* is nearly closed in order to admit atmospheric air in limited quantities to the recirculated surcharged oxidizing atmosphere, such inflow of new atmospheric air to the surcharged flowing atmosphere being desirable for conditioning such recharged atmosphere and to supply thereto the oxygen required to be combined with the coatings. Provision is thus made for conditioning the surcharged atmosphere during the cycles of its recirculation by heating or boosting the temperature and by mixing with such surcharged atmosphere a determined limited volume of fresh atmospheric air.

Subsequently to the first stage wherein the coating is retained in a softened condition at and during the oxidation of such coating, and following the oxidation stage, the coating is dried and further oxidized by flowing for a desirable period of time fresh or new atmospheric air into contact with the coatings, the air during such second stage being at atmospheric temperature and being conditioned as to its moisture content, for which air conditioning treatment the condenser I is brought into service, whereby dehydrated air in a relatively cool condition being conducted into contact with the pre-oxidized coatings. Depending upon the temperature and humidity of the fresh atmospheric air employed for the treatment at the second stage, I bring into service the condenser I without or with the heater J, but at the second stage it is desirable that cool fresh air with a low moisture content be circulated in relatively large volumes within the treatment chambers, the inflow and outflow of the conditioned atmosphere being continuous. To these ends, at the second stage, the valve *k* is opened wide for the free inflow of the desired large volume of fresh new atmospheric air, and the condenser I is brought into service by flowing cold water or other cooling medium through the pipe or coils, the latter being in the path of the fresh air which thus contacts with the cold surfaces of the condenser, as a result of which the aqueous content or the moisture present in the air is condensed, and the air in a dehydrated and cool condition is thus circulated into contact with the coatings present on the material. The flow of dehydrated cool fresh air, in large volumes, into contact with the oxidized coatings has the effect of drying the softened coatings and of cooling such coatings. The two-stage treatment is conducted on the coatings while the material remains within the chambers, i. e., without removing the material from said chambers, reducing the labor required ordinarily to place the materials in and remove them from the chambers, and thus the coatings are oxidized (baked) and dried by a continuous operation performed at two distinct stages by atmospheres conditioned to meet the requirements of the respective stages.

Upon the expiration of the time required or allotted for the first stage of the treatment, the heater I is cut out of service, the cooler and condenser J is brought into service, the gate to intake *k* is opened fully, and the dampers are adjusted as described so that the blower M acts to establish the flow of cool fresh air through the chambers A B, such air flowing out of the outlets O without recirculation. This constitutes the second stage of treatment, and by it fresh air is supplied to carry oxygen to the coated materials for completing the oxidization of the coated surfaces so as to eliminate the tacky or sticky condition and to cool the products so that the latter in a cool dry condition may be removed from the chambers A B and thereafter packed for shipment to the consumers.

The apparatus disclosed herein forms the subject-matter of a separate application, Se-

rial No. 286,358, filed by me on June 18, 1928, as a division of the present application.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. In the art of conditioning coated materials, the process which consists in circulating into contact with the coated surfaces an oxidizing atmosphere conditioned by the presence therein of volatile constituents emanating from such coatings, and thereafter flowing fresh atmospheric air conditioned as to its moisture content into contact with such coated surfaces.

2. In the art of conditioning coated materials, the process which consists in placing the coated materials within a chamber, recirculating into repeated contacts with such surfaces an oxidizing atmosphere conditioned by the presence therein of volatile vapors emanating from the coatings, then stopping such circulation of the oxidizing atmosphere, and flowing dehydrated atmospheric air into contact with said coated surfaces and while the material remains within the chamber.

3. In the art of conditioning coated materials, the process which consists in placing coated materials within a chamber, recirculating into repeated contacts with such coated surfaces an oxidizing atmosphere surcharged with vapors emanating from the coatings, heating the atmosphere during the cycle of its recirculation, conditioning such atmosphere by mixing therewith fresh atmospheric air in limited volumes during the recirculation, arresting the flow of such oxidizing atmosphere, and thereafter flowing dehydrated atmospheric air into contact with said coatings.

4. In the art of conditioning coated materials, the process which consists in placing coated materials within a closed chamber, blowing into contact with such coated surfaces atmospheric air surcharged with volatiles emanating from said coatings, heating the surcharged air in the cycles of its recirculation, arresting the flow of the oxidizing atmosphere, and thereafter flowing dehydrated atmospheric air into contact with said coatings and while the material remains within said chamber.

5. In the art of conditioning coated materials, the process which consists in placing coated materials within a closed chamber, blowing into contact with the coated surfaces an oxidizing atmosphere conditioned by emanations from the coatings and in a filtered condition to effect the oxidation of the coatings and to eliminate a tacky or adhesive surface from the coated materials, discharging the air from said chamber, and dehumidifying and conditioning fresh air prior to blowing the same into contact with said coated surfaces.

6. In the art of conditioning coated materials, the process which consists in recirculating into repeated contacts with such coated surfaces an oxidizing atmosphere conditioned by emanations from the coatings while heating the atmosphere during the cycles of its recirculation, arresting the flow of such oxidizing atmosphere, and thereafter blowing into contact with said coatings an atmosphere in a dehumidified condition.

7. In the art of conditioning coated materials, the process which consists in recirculating into repeated contacts with such coated surfaces an oxidizing atmosphere conditioned by emanations from the coatings, while heating and conditioning the atmosphere during the cycles of its recirculation, arresting the flow of such oxidizing atmosphere, and thereafter blowing atmospheric air in a dehumidified condition into contact with such coated surfaces.

8. In the art of conditioning coated materials, the process which consists in placing coated materials within a closed chamber, recirculating into repeated contacts with such coatings an oxidizing atmosphere conditioned by emanations from said coatings while mixing fresh air therewith during the cycles of its recirculation, arresting the flow of the oxidizing atmosphere, thereafter blowing atmospheric air in large volumes into contact with said coatings, and discharging such air from the chamber.

9. In the art of conditioning coated materials, the process which consists in circulating for a desirable period of time and into contact with the coated surfaces an oxidizing atmosphere conditioned by emanations of volatile constituents from the coatings, and thereafter flowing fresh atmospheric air into contact with such coated surfaces.

10. In the art of conditioning coated materials, the process which consists in flowing into contact with such coatings an oxidizing atmosphere conditioned by emanations of volatile constitutents from such coatings whereby the coatings are oxidized throughout the depth thereof while such coatings remain in a softened condition, and thereafter flowing into contact with the oxidized coatings fresh atmospheric air in large volumes to effect the drying of the softened coatings.

11. In the art of conditioning coatings on materials, the process which consists in recirculating into contact with such coatings an oxidizing atmosphere conditioned by emanations from the coatings, and thereafter flowing dehumidified air into contact with such coatings.

In testimony whereof I have hereto signed my name this 7th day of January, 1925.

GORDON D. HARRIS.