

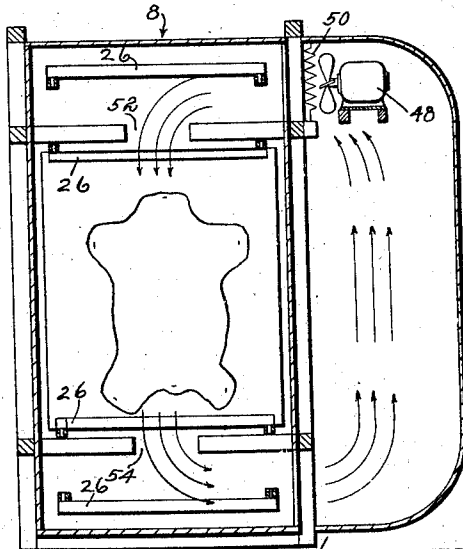
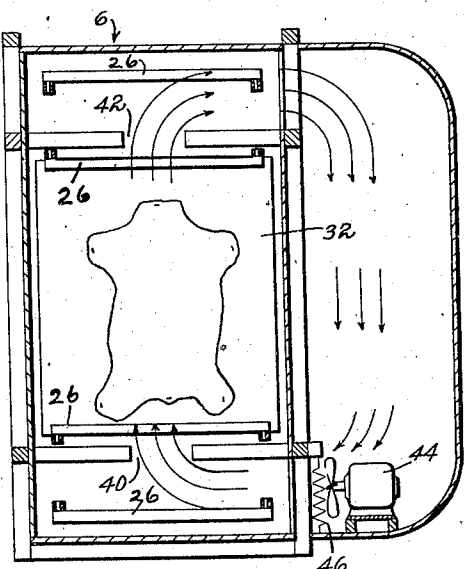
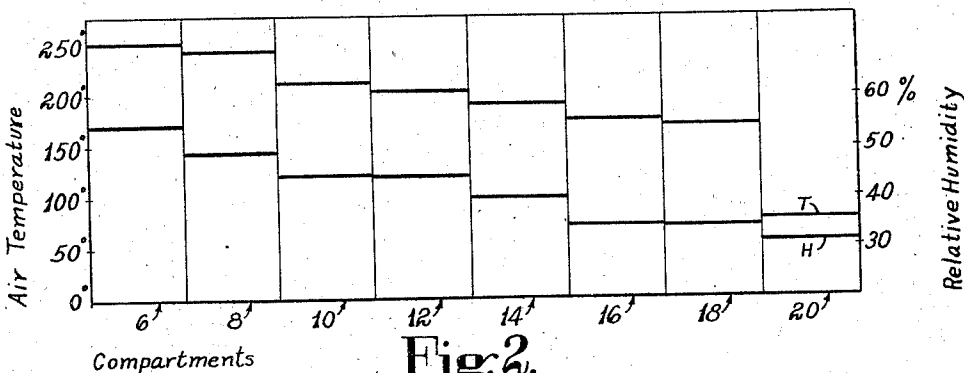
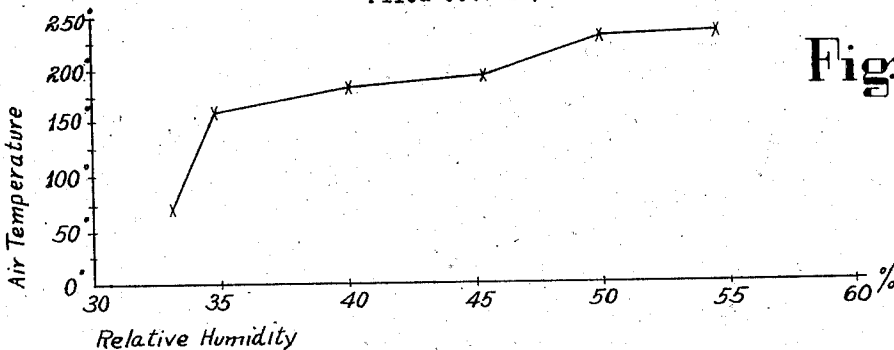
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H. W. HYDE ET AL
METHOD OF DRYING HIDES AND SKINS

2,168,478

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2 Sheets-Sheet 1



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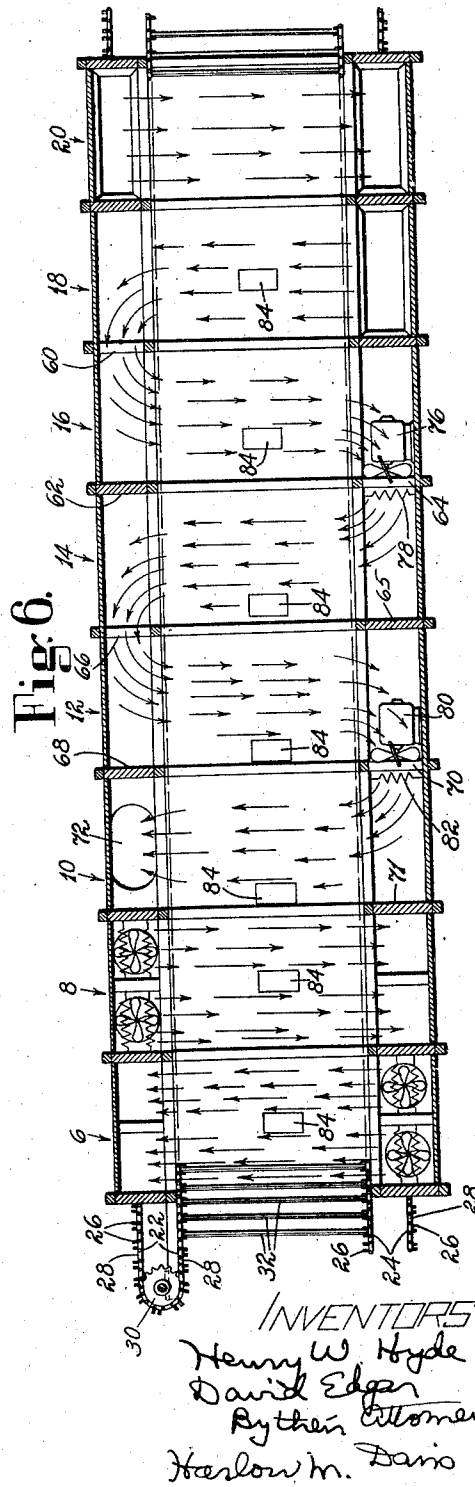
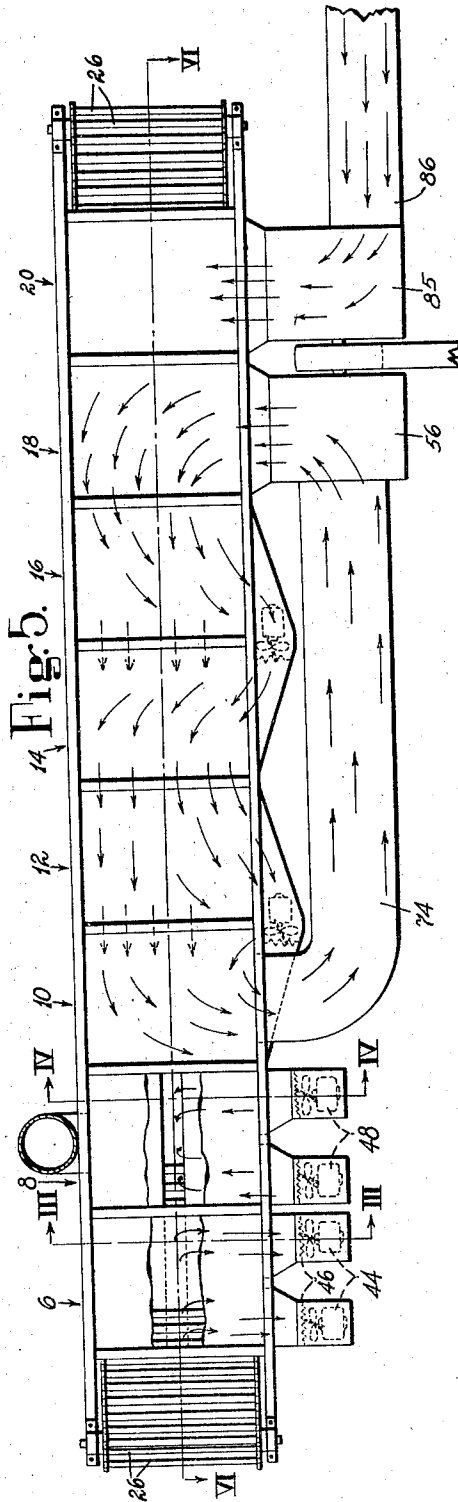
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METHOD OF DRYING HIDES AND SKINS

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2 Sheets-Sheet 2



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METHOD OF DRYING HIDES AND SKINS

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11 Claims. (Cl. 34—24)

This invention relates to methods of drying hides and skins. While the invention is illustrated with reference to the drying of chrome tanned skins in slicked-out condition on suitable supports, it is to be understood that the invention and various important characteristics thereof may have other applications and uses.

It is an object of the invention to facilitate the drying of hides and skins in such manner as to minimize the amount of time required in the drying operation, thereby increasing the output of a given drying unit. It is a further object of the invention to produce a better product in the drying of hides and skins, whereby they emerge from the drier in an improved, relatively soft and plump condition.

It is an important characteristic of the invention that, at the outset of drying operations upon hides or skins, they are subjected to treatment by air circulating at high temperatures, of the order of 212° F. and over, to raise the temperature of the hides or skins and of the watery contents thereof to a high degree in minimum time, thereby greatly facilitating evaporation, as a preliminary to other treatment by cooler air to complete the drying operation. Preferably the hides or skins are initially treated by air circulating at about 250° F. and are then subjected to air of gradually decreasing temperature and lower relative humidity to complete the drying operations.

Hides and skins differ from all other sheet material in that the middle back portions thereof are relatively thicker and denser in structure than the looser textured belly, flank, and shank portions. It is clear then that the last-named portions of each hide or skin will dry much more readily than other portions and may even become dry and hard while the back portions are still moist. Accordingly, it is contemplated to give the back portions of each hide or skin a preliminary heat treatment substantially greater in extent than other portions of these same hides or skins. To this end, currents of air at temperatures within the range of about 212° F. to about 250° F. are directed along these back portions from one end of the skin to the other, thus quickly raising the temperature of these parts and thus facilitating drying operations. It is to be understood that all the other portions of each hide or skin get a substantial heat treatment simultaneously with the special treatment of the back portions. However, the main currents of air are preliminarily restricted to the back portions of each hide or skin to raise these portions to a high temperature in minimum time. Pref-

erably air currents at high temperature, flowing parallel to the backbone line of each hide or skin, are caused to move alternately in opposite directions, i. e., from neck to butt and from butt to neck, thus tending to secure more complete uniformity in the heating and drying effects of the air currents.

These and other important characteristics of the invention will now be described in detail in the specification and then pointed out in the appended claims.

The invention is illustrated with reference to a drier and to charts shown in the accompanying drawings, in which

Fig. 1 is a chart indicating the relationship of air temperature and relative humidity during drying operations on hides or skins in accordance with the method herein described;

Fig. 2 is another form of chart which indicates relationship of temperature and relative humidity in successive compartments of a drier utilized in the practice of the method;

Fig. 3 is a sectional view taken along the line III—III of Fig. 5 showing the location and direction of air currents with respect to a skin slicked out on a board;

Fig. 4 is a view similar to Fig. 3 taken along the section line IV—IV of Fig. 5;

Fig. 5 is a more or less diagrammatic top plan view of a drier which may be utilized in the practice of the method; and

Fig. 6 is a vertical longitudinal sectional view taken along the line VI—VI of Fig. 5 and looking in the direction of the arrows.

In the illustrated apparatus, which is designed specially to practice our improved method of drying hides and skins, there is provided a relatively long chamber made up of communicating compartments 6, 8, 10, 12, 14, 16, 18 and 20, in line with each other. Traveling through all of these compartments is a conveyor mechanism comprising an upper endless conveyor 22 and a similar endless conveyor 24 at the bottom of the chamber. As shown most clearly in Fig. 6, each conveyor is provided with trough-like carriers 26 to hold the sheet material to be dried. Conveniently these carriers 26 are metal members extending across and connecting endless link chains 28 (Figs. 5 and 6) which pass around sprocket wheels at each end of the chamber, one of the sprocket wheels being shown at 30 in Fig. 6. It will be understood that the chains 28 are suitably supported between their end sprockets in accordance with well-known practice.

Upon inspection of Fig. 6, it will be clear that a trough-shaped carrier 26 upon the upper run of the lower conveyor 24 is in vertical alignment with a trough-shaped carrier 26 on the lower run of the upper conveyor 22 so that a board 32 may be slid endwise into the carriers 26 and be held firmly in vertical position for travel through the drier chamber. The boards 32 may be of any well-known construction and are each adapted to have a hide or skin slicked out thereon and attached thereto before the said board is introduced into the drying chamber. Each board may have a skin slicked out on each side thereof. Alternatively each board may carry only one skin in which case two boards will be placed back to back in each pair of upper and lower carriers 26. It will be readily understood that the boards with the work pieces thereon are introduced at the left end of the drier chamber (Figs. 5 and 6) and are removed at the right end of the drier chamber as they are presented at the latter end progressively with the travel of the conveyor mechanism through said drier chamber. At the end of this journey through the drier chamber, the hides or skins are in a satisfactorily dried condition. Hence, when the boards are removed from the chamber they are first separated from the dried hides or skins and are then returned to a station adjacent to the entrance end of the chamber where other hides or skins may be attached to the said boards for a trip through the drier.

Upon reference to the charts shown in Figs. 1 and 2, the relationship and range of air temperatures and of relative humidity throughout the drying operation will be found clearly indicated. It is to be understood that the range of air temperature and relative humidity may be varied somewhat from that indicated without departing from the substance of the invention.

Shortly after their introduction into the conveyor mechanism, the skins enter the first compartment 6 where the drying operation begins. As shown most clearly in Fig. 3, air is circulated through this compartment in a direction such that the heated air travels from one end to the other of the skin in an upward direction and substantially parallel to the backbone line of the skin. Preferably, and as shown, the inlet and outlet openings 40, 42, respectively, are so constructed and arranged that the air currents are restricted mainly to those portions of each skin adjacent to the backbone line thereof, the purpose being to supply in abundance heated air to the denser and thicker portions of each skin, as distinguished from the thinner and more loosely textured portions of the belly, flanks, and shanks of these same skins. It will be understood, of course, that all of compartment 6 is heated by the hot air circulated therethrough. However, the velocity of the air currents is much greater along and over the heavier portions of each skin where it is more difficult to heat and to evaporate the moisture. The treatment in this compartment lasts about eighteen or twenty minutes.

For circulating the air through the compartment 6 at a velocity of about 2000 feet per minute there are provided two or more blowers indicated at 44 which direct the air through heating units conveniently shown as electric resistance units as indicated at 46, although steam pipes may be used if desired. By the use of adequate equipment, as shown, the air in the compartment 6 is readily maintained at a temperature of about

250° F. Since the skins have been freshly slicked out upon the boards 32 just before the introduction of the latter into the compartment 6, there is a substantial amount of liquid ready to be vaporized by the hot air currents which sweep through the compartment in the manner described. Accordingly, it is found that the relative humidity of the circulating air remains pretty constantly at about 56%.

As the conveyor mechanism moves the work pieces slowly through the compartment 6 the skins are quickly heated to a high temperature. This is not only true of the hide or skin substance but of their watery contents. This condition favors evaporation to a marked degree. While a substantial amount of evaporation takes place, the amount of which may be controlled by admitting outside drier air into the compartment 6, the main purpose is to bring the hides or skins and the watery content thereof quickly to a high temperature in a minimum time, thereby contributing greatly to the rapidity of drying operations in succeeding compartments.

As the skins on their supporting boards 32 pass into compartment 8, they are subjected to very much the same conditions as in compartment 6 with the exception that the air currents are traveling in the opposite direction from end to end of each skin, thus tending to make uniform the treatment of all those thicker denser portions lying along each side of the backbone line of each skin. If the boards 32 be placed in the conveyor mechanism with the neck portion up, as indicated in Figs. 3 and 4, the air currents in the first compartment 6 are passing from butt to neck, there being thus a tendency to remove more moisture from the butt end of the skin than from the neck end thereof. However, any tendency to non-uniformity in this respect is corrected in compartment 8 (Fig. 4) wherein the air currents are directed from neck to butt. In this compartment, blowers 48 are provided at the top of the compartment to blow air through electrical heating units 50 to heat the air which passes through inlet and outlet openings 52, 54, respectively, so as to restrict the air currents very largely to the backbone portions of the skins. Inasmuch as more outside (or drier) air is admitted into the compartment 8, the temperature thereof is somewhat lower than the corresponding air in compartment 6, being about 248° F. with a relative humidity of about 52%. While substantial evaporation is taking place in compartment 8 it is still a main characteristic of the operation that the hides or skins are being heated to a relatively high temperature. The treatment in this compartment lasts about eighteen or twenty minutes. From then on, the temperatures in the various compartments drop substantial amounts from compartment to compartment as the drying progresses.

Upon inspection of Figs. 5 and 6, it will be observed that the air current through compartments 10, 12, 14, 16 and 18 is directed alternately upwardly and downwardly of the skins on the drying boards, and that the direction of the air current is from a compartment 18, where the skins are drier, to other compartments where the skins are relatively more moist. As shown, air currents enter the compartment 18 from a blower compartment 56 (Fig. 5), pass upwardly through the bottom thereof and spread out to pass over the whole surface of each skin, it being understood that the vertically positioned drying boards 32 direct the air upwardly through the spaces

between the said boards and that the air is free then to pass from an enclosure at the top of the chamber 18 through an opening 60 (Fig. 6) into the top of the compartment 16, the air being forced to move downwardly through the spaces between the boards 32 in said compartment since there is a wall 62 between the enclosure at the top of compartment 16 and the enclosure at the top of compartment 14. From the bottom of the compartment 16 the air currents pass through an opening at 64 into the bottom of the compartment 14. Because of a wall located at 65, the air currents must now pass upwardly between drying boards in the compartment 14 to an enclosure at the top of said compartment from which the air escapes through an opening 66 into the enclosure at the top of the compartment 12. Here, again, because of a wall 68, the air must pass in a downward direction through the compartment 12, thence through an opening 70 into an enclosure (having an end wall 71) at the bottom of the compartment 10, through which it passes in an upward direction and finally out through an opening 72 (Fig. 6) into a conduit 74 (Fig. 5) which takes the air back to the blower chamber 56.

As indicated most clearly in Figs. 5 and 6, a booster blower 76 and heating unit 78 is provided adjacent to the opening 64 between compartments 14 and 16, there being a similar booster blower 80 and heater unit 82 adjacent to the opening 70 between compartments 10 and 12. By this means the air in compartment 10 is maintained at a temperature of about 210° F., the relative humidity being about 48%. The air temperature becomes gradually less as the hides or skins travel along the drier chamber, the temperature in compartment 12 being about 198° F., in compartment 14 about 195° F., in compartment 16 about 180° F., and in compartment 18 about 162° F. The amount of moisture in the air is gradually decreasing at the same time, as shown by the fact that the relative humidity in compartment 10 is 48% while in compartment 18 it is about 35%. While the construction is such that air is recirculated through the compartments 10 to 18, inclusive, it is to be understood that openings are provided in the side walls of the compartments with suitable covers 84, which may be readily manipulated by the worker, to permit introduction of outside air as a measure of control of both humidity and temperature, it being understood further that suitable recording instruments for both humidity and temperature may be provided for each compartment.

Air, for the last compartment 20 enters the top of the compartment from a blower box 85 (Fig. 5) and passes downwardly in the spaces between the drying boards, and out into the room. This air reaches the compartment 20 through a conduit 86 which takes warm air from the top of the room in which the drier is located, provision being also made to take some or all of the air from out-of-doors, depending upon the temperature and the relative humidity of the out-door air. The average temperature of the compartment 20 is about 72° F. and the relative humidity a little over 30%. This means that the air is quite dry and that the temperature is low compared with the range of temperatures in the preceding compartments. This seems to be a decided advantage since it causes the leather to come out soft and plump.

It will be noted that, in the foregoing description, temperatures of the circulating air only have been given as indicating the heat treatment

of the skins in the various compartments of the drier chamber. However, these air temperatures give little or no indication of the temperature of the skins in these various compartments. Whereas the air temperature in the first compartment is approximately 250° F., the skin which has traveled almost through this compartment and is about to leave it for the next compartment is found to have a temperature of 142° F. in its bottom center portion, 134° F. in its top center portion, with about 116° F. in the flanks. Since these skins at the time of entering the drier chamber were at room temperature (about 80° F.), it will be seen that the temperature of the skin and its watery content was raised very promptly through treatment by air circulating at 250° F. This same skin at the end of its travel through the next compartment 8, wherein it received treatment by air circulating at 245° F., had reached a temperature of 148° F. at both top and bottom centers, with a temperature of 124° F. in the flanks. While the temperature of the circulating air in the third compartment 10 drops to about 210° F., the temperature of the skin at the end of this compartment was up to 149° F. in both top and bottom centers, with the flanks at 136° F. In the fourth compartment 12 with air circulating at about 200° F., the temperature of the skin in top and bottom centers was 148° F. with the flanks at 144° F. The temperatures of the skin in the fifth and sixth compartments 14 and 16 were substantially those of the skin in the fourth compartment while in the seventh compartment 18 where the temperature of the air is about 160° F., the skin has a temperature of 148° F. in all portions thereof including the flanks. At the end of the drier, i. e., at the end of compartment 20, the skin had a temperature of 98° F. in all portions. The figures given as skin temperatures are approximate only because of the difficulties in getting the skin temperature through manipulation of the thermometers and of the skin portions which had to be lifted from the board. Still it is believed that the temperatures given above are not more than three or four degrees below actual temperatures of the skins in the different compartments and that the data thus secured reflects accurately the range of temperatures of the skins throughout the illustrated drier. It is to be noted that, whereas the air temperatures were relatively very high, reaching 250° F., the skins at no time exceeded a temperature of about 150° F. For chrome-tanned skins this is an entirely safe temperature, in fact substantially below the temperature that might be applied with safety, since chrome-tanned skins will stand much higher temperatures than skins tanned with any other tanning material. It is to be noted also that while air was circulated through the first two compartments at over 245° F., and while the air temperature was progressively lowered in the succeeding compartments, still the skins maintained substantially the same temperature throughout the third, fourth, fifth, sixth and seventh compartments as that attained at the end of the first two compartments. The explanation of the fact that the skins at no time exceeded a temperature of about 150° F. is that the occurrence of evaporation helped to keep the temperatures of the skins much lower than that indicated for the circulating air. In other words, while the skins were being heated to high temperatures in minimum time in the first two compartments, they were also being subjected

to very substantial evaporation of their watery contents. It is therefore a matter of importance that skins subjected to air at very high temperatures in drying operations should have a substantial watery content to begin with or that the highly heated air should have high relative humidity to effect quick drying without damage to the tanned skins.

The length of the chamber and the speed of the conveyor mechanism is such that a hide or skin entering the inlet end of the drier chamber appears at the outlet end in about two and one-half hours.

Having described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. That improvement in methods of drying mineral tanned hides and skins, which comprises subjecting each hide or skin to currents of air at temperatures around 250° F. to heat such hide or skin and the watery contents thereof to a high temperature in minimum time, thereby providing conditions which favor and effect rapid evaporation of the water in the hide or skin, and subsequently subjecting these same hides and skins to air of gradually decreasing temperature and lower relative humidity to complete the drying operation.

2. That improvement in the methods of drying mineral tanned hides and skins, which comprises subjecting the thicker denser middle back portions of each hide or skin to currents of air at temperatures of about 250° F. to heat such portions and the watery contents thereof to a high temperature in minimum time, and subsequently subjecting all portions of these same hides and skins to air of gradually decreasing temperature and lower relative humidity to complete the drying operation.

3. That improvement in methods of drying mineral tanned hides and skins which comprises subjecting each hide or skin to air at temperatures in the range between about 245° F. and about 250° F. for about 40 minutes and subsequently subjecting the same hide or skin to air currents of temperatures ranging from about 180° F. gradually down to about 80° F. with a gradual decrease in relative humidity to about 30% to effect uniform drying of the hide or skin.

4. That improvement in methods of drying tanned hides and skins which comprises, blowing currents of air from one end to the other of each hide or skin along lines parallel to the backbone line of the hide or skin, and preliminarily restricting the greater portion of the air currents to those portions of the hide or skin lying closely adjacent to the backbone line of each hide or skin.

5. That improvement in methods of drying tanned hides and skins, which comprises blowing currents of air alternately in different directions from one end to the other of each hide or skin along lines substantially parallel to the backbone line of each hide or skin, and, for a certain part of the time of treatment, substantially restricting the air currents to those portions of each hide or skin lying adjacent to the backbone line thereof.

6. That improvement in methods of drying mineral tanned hides and skins which comprises circulating air heated to temperatures above about

212° F. in directions substantially parallel to the backbone line of each hide or skin, and preliminarily restricting currents of air at temperatures of about 245° F. and over for a period of about 40 minutes substantially to those portions of each hide or skin lying along and adjacent to the backbone line thereof.

7. That improvement in methods of drying mineral tanned hides and skins, which comprises blowing air heated to temperatures within the range of about 212° F. to about 250° F. in different directions from one edge to another of each hide or skin for a period of about 60 minutes, and, during the earlier part of the drying operation, when the air temperature is highest restricting the currents of air substantially to those portions of each hide or skin lying along and adjacent to the backbone line thereof.

8. That improvement in methods of drying chrome tanned hides and skins which comprises blowing air heated to temperatures within the range of about 220° F. to about 250° F. in different directions from one edge to another of each hide or skin, during the earlier part of the drying operation, restricting the currents of air substantially to those portions of each hide or skin lying along and adjacent to the backbone line thereof, and subsequently subjecting all portions of each hide or skin to currents of air at temperatures gradually reduced from about 220° F. to about 70° F. and with the relative humidity of such heated air gradually reduced to about 30%, so that all portions of each hide or skin will receive treatment designed to secure uniform drying effects.

9. That improvement in methods of drying chrome tanned hides and skins which comprises subjecting hides or skins to currents of air at temperatures in the range of about 220° F. to about 250° F. and relative humidity of about 50% to effect removal of moisture from the hides or skins without actual drying thereof, and subsequently subjecting these same hides and skins to cooler relatively dry air to complete the drying operation.

10. That improvement in methods of drying chrome tanned hides and skins which comprises circulating air of relative humidity about 50% and of a temperature about 240° F. in directions substantially parallel to the backbone line of each hide or skin, restricting the currents of air to those portions of each hide or skin lying along and adjacent to the backbone line thereof, subsequently subjecting each hide or skin to currents of air at temperatures gradually reduced from about 212° F. to about 160° F. in such manner that all portions of each hide or skin receive treatment by such air to secure uniform drying effects, and finally subjecting all portions of each hide or skin to cooler dry currents of air to effect completion of the drying operation.

11. That improvement in methods of drying tanned hides or skins, following such operations as tanning and coloring in solutions, which comprises subjecting them to air of temperatures of 245° F. and over and of high relative humidity, for example, of about 50% and over for a period of about 40 minutes.

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