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PROCESS OF TANNING LEATHER

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This invention relates to improvements in the process of tanning leather and its object in general is to both greatly reduce the time consumed in performing the tanning process and to improve the quality of the tanned leather.

In the art of tanning leather it has been customary to first submit the hides to a lime treatment for the purpose of plumping the hides and also to facilitate the removal of hair and flesh. After the hides have been limed it is customary to submit them to a partial deliming process, although this is not always considered essential and will depend to some extent upon the character of the water used in the softening and liming and incidental work of removing the hair and flesh which is usually referred to as the beam house process, and the de-liming process therefore, may be either entirely omitted or may be carried on to an extent considered sufficient by the tanner.

The next step in the tanning process usually consists of passing the hides through a series of vats called rocker sections in which the hides are hung and agitated. These vats contain a tanning solution and the strength of the solution varies through the rocker section ranging at the head of the series from a strength of approximately 20° to 40° barkometer to 5° or 10° at the tail of the series. The hides are introduced at the tail of the series of rocker vats, which are usually arranged in sections, where the liquor is weakest and are moved successively through the series to the head vat and where the liquor is the strongest. It has been necessary heretofore to leave the hides in the rocker vats for a period of from ten to thirty days.

After the hides leave the rocker section they are placed in so called layaway vats in which they are laid horizontally one upon another and the layaway vats contain a tanning solution considerably stronger than is contained in the rocker sections. The hides are usually permitted to remain in the layaway vats for twenty to seventy days, the time depending upon the thickness and quality of the hides and, the class of leather desired all according to the judgment of the tanner. It is intended that the hides shall remain in the layaway vats at least until the solids in the tanning solution have completely penetrated the hides.

After the hides have thus been thoroughly penetrated with the solids contained in the tanning solution they are submitted to a mechanical flexing in the presence of hot tanning solutions of considerable strength. This mechanical flexing is customarily performed by placing the hides in a rotating drum which contains the hot tanning solutions and this action drives additional quantities of the solids contained in the tannin solution into the hides which is well known as desirable to improve the quality of the final product leather.

The well known process as heretofore described necessarily involves a great amount of time and capital and expense incidental thereto and also the loss of tannin by inversion as well as the labor required handling the hides during the lengthy process. Large quantities of tanning solutions are necessary for the long period of time during this process which is subject to leakage and inversion as before referred to.

During this process it has been customary and found necessary to frequently drain into the sewer large quantities of the contents of the tail rocker vat of the rocker section since the contents of this tail vat becomes foul with lime and other objectionable matter which is drawn from the hides while remaining in this vat. This tail rocker vat is so low in strength of tannin and purity and having remained in the process for so long a time acts upon the hide in an objectionable manner and while in contact with the hides contains the properties of forming objectionable acids detrimental to the manufacture of good finished product.

The present invention greatly reduces the length of time required to completely penetrate the hides with tannin and the solid matter contained in the tannin solutions and also improves the quality and color of the leather and eliminates entirely the wasting of tanning solutions. It greatly reduces the number of vats required and the space occupied and the labor expense incidental to a longer tanning process.

In performing the process embodying the presinvention the hides are submitted to the liming or beam house process in the usual way and also delimed if desired as has been customary which processes are performed in the so-called beam house. After leaving the beam house the hides are submitted to a solution of sodium bi-sulphite or its equivalent and water. Preferably the solution contains not less than 2% nor more than 10% of sodium bi-sulphite but the strength of the solution will depend upon the weight and character of the hides.

In submitting the hides to this solution they are preferably immersed in a vat containing the solution where they will be rocked or paddled or merely immovably suspended or they may be wheeled in the solution and the time consumed

in this treatment may be from five minutes to several hours depending upon the thickness and character of the hides and the quality of the final leather which is required.

After being treated with the sodium bi-sulphite solution the hides are subjected to a bath of water containing approximately from ¼ of 1% to 1% of formaldehyde or its equivalent, preferably submerging them in a vat containing the said formaldehyde solution and leaving them in the solution from one to five hours depending upon the thickness and quality of the final leather desired. If desired the bi-sulphite treatment and the formaldehyde treatment may be performed in the same vat since the action of the bi-sulphite treatment is that the sodium bi-sulphite in the solution leaves the water and enters the hide leaving substantially clear water in the vat into which the formaldehyde may be introduced after the bi-sulphite treatment has been completed and the hide permitted to remain in the same vat immersed in a formaldehyde solution for the desired period of time.

The aforedescribed treatment of the hide causes it to be penetrated with sodium bi-sulphite and the hide to be set by action of the formaldehyde. The action of the sodium bi-sulphite first removes all objectionable matter from the surface of the hide leaving the hide in a condition so that it will readily receive tannin and the solid matter contained in the tanning solution. It also conditions the hide so that it will not be injured by initial applications of a strong tannin solution which liquor may also be heated to a considerable extent without injury to the hide.

After treatment with sodium bi-sulphite and formaldehyde the hide is subjected to treatment of tannin solutions. This tannin solution treatment may be accomplished in any suitable manner and if desired any reasonable conventional process may be used in which the hide is carried through a series of rocker vats and layaway vats and then mechanically flexed in a drum containing hot strong tanning solutions, or any part of this process may be used in making a combination of the solids in the tannin solution with the hide substance. It will be found that by using any reasonable conventional tanning solution that this process will be found to combine the solid in the tannin solution with the hide substance much more quickly than in the conventional methods and that a much stronger tannin solution with more heat can be used with safety, resulting in saving of time and its attendant lower costs of tanning.

It has been found that whereas with the prior known methods of tanning it has been impossible to submit the white hide without injury to an initial tanning solution having a strength greater than 30° barkometer than in the present process after the hide has been subjected to the sodium bi-sulphite treatment it may be immersed without injury in a tanning solution of 60° barkometer strength or greater. It has also been found that after the sodium bi-sulphite treatment in the present process the hide may be subjected to a tanning liquor having a temperature of 90° F. or greater whereas in the former conventional method the white hide would be injured if the temperature of the initial tanning liquor was greater than approximately 80° F.

The preferred method is to immerse the hide after the sodium bi-sulphite and formaldehyde treatment in a series of rocker vats which contain tannin solutions of a strength of 60° barkometer or higher and preferably the initial solution has a temperature of at least 90° F. and ordinarily it will be found that the hide is thoroughly struck or penetrated with tannin in a period of not more than ten days. After the rocker vat treatment the hides may then be put into a drum containing a strong hot tannin solution to drive an additional quantity of the solids from the tanning solution into the hide substance. The initial solution should not be less than 40° barkometer.

While in most cases it will be found preferable to subject the hide to the sodium bi-sulphite and formaldehyde treatments before it has come in contact with any tanning solution, and to then complete the tanning process without repeating the sodium bi-sulphite treatment, in treatment of some kinds of leather it is desirable that after the hides have been subjected to the sodium bi-sulphite, the formaldehyde and a partial tanning of the hides in tanning solutions, the hides should be removed from the tanning solution and introduced into a bath of sodium bi-sulphite for the purpose of recharging the hide substance with sodium bi-sulphite for the purpose of aiding the further and complete penetration of the hide substance. Although preferable, as above stated, to perform the sodium bi-sulphite and formaldehyde treatment before the hide is subjected to any tanning solution it is conceived that a sodium bi-sulphite treatment at any stage of the tanning process is advantageous.

An additional step may be introduced into the process for the purpose of improving or insuring the ultimate color of the leather which step consists of coloring the hide immediately after the sodium bi-sulphite and formaldehyde treatments when it is in condition to indelibly receive coloring matter. This coloring of the hide may be accomplished in different ways and by various substances.

A comparatively small amount of tannin may be introduced into the formaldehyde solution which will penetrate the surface of the hide and establish a base color prior to introducing the hide into the stronger tannin solution where the actual tanning of the hide takes place. A strong solution will also color but is not needed. It is generally understood that the initial color which is given to the hides at the outset predetermines to a large extent the ultimate color of the finished leather and therefore the introduction of selected tannin solutions into the formaldehyde bath will establish a color in the white hide which will control and insure a uniform proper color in the finished leather.

If preferred so-called fast dye solutions may be substituted for the above described tannin solution for the purpose of coloring the white hide and such dyeing solutions may either be introduced into the formaldehyde bath or the hide may be subjected to the dyeing solution before or after the formaldehyde treatment has been completed. In some cases the formaldehyde treatment may be omitted and when the process is so performed the coloring treatment, either by a weak tannin solution or by a fast dye solution will immediately follow the sodium bi-sulphite treatment.

It has been found that the sodium bi-sulphite clarifies the tannin and converts the insolubles in the tanning solution into soluble tannins. It also has the characteristics to render the harsh tannins more mellow. The sodium bi-sulphite acts to neutralize the lime present in the surface of the hide as well as in the interior as far as the

bi-sulphite is allowed to penetrate, and also dissipates to some extent the grease which remains in the hides after the beam house process is completed, the removal of the grease being advantageous to permit quick and uniform penetration of the hide with the tannin solutions.

The treatment with sodium bi-sulphite removes the objectionable matter from the surface of the hide and neutralizes or removes the lime therein to a large extent and the residue in the sodium bi-sulphite vat may be drained away obviating the necessity of draining away the contents of a rocker vat containing valuable solutions of tannin mixed with such objectionable matter, as was necessary in the former conventional process.

It has been found that hides tanned by the process of the present invention as compared with hides tanned in the conventional manner are of superior quality in many respects. The grain is finer and the final color more satisfactory. The grain portion is thicker and the buffing quality of the grain is of a better character. The fibres are tougher and more resilient.

In addition to the advantages of quality of leather produced by this method and of equal importance, the present process greatly reduces the time and expense involved in the process described in this invention. The hide may be completely tanned in a period of from six to fifteen days after it leaves the beam house, whereas in previously known methods the time consumed to properly tan a hide would not be less than twenty days and then only with special expensive methods. The usual time required has been from fifty to seventy days and therefore any reduction in the time consumed in tanning automatically proportionately reduces the capital investment.

Further, much less floor space, buildings covering same, vats, incidental machinery, volume of tanning solutions and labor expense will be coincident with the use of the present invention.

While the process of the present invention has been described in a specific manner it is conceived that various modifications may be resorted to within the scope of the invention. For example, it is not considered essential to include the formaldehyde treatment in the process since desirable features of the invention may be obtained by the use of sodium bi-sulphite bath. The additional treatment of the formaldehyde bath is desirable and adds to the quality of the finished product. Also it is to be understood that wherein specific strength and temperatures of solutions have been designated they refer to the treatment of hides suitable for sole leather etc. and that other hides will require different strengths and temperatures of solutions. In all cases however in the treatment of comparative grades of hides stronger tanning solutions may be used after the sodium bi-sulphite treatment than has heretofore been possible without such treatment and also such tanning solutions may be at higher temperature than has heretofore been possible without the sodium bi-sulphite treatment.

From my description it will be seen that the delimed hide is prepared by treating the same with the solution containing principally sodium bi-sulphite, it being noted that this is effectively absorbed by the hide so that the prepared hide is surrounded by substantially clear water.

When the hide reaches the stage in the bi-sulphite treatment that it is supported in substantially clear liquor, formaldehyde should preferably be added and while the formaldehyde solution does its work and apparently reacts with the sulphite to permeate the hide and have its tanning effect, yet I have found that tannin solution introduced at this time has a very beneficial effect on the color of the leather and, as I have indicated, fast dyes may be introduced either in addition to the tannin solution or without the tannin solution. The tannin solution then being introduced penetrates the hide most effectively as it has been previously permeated with the formaldehyde.

When the hide is prepared in this way, it can be at once treated with a strong solution of tannin and the same may be heated. The hide at once absorbs the tannin and may then be passed to a vat with still stronger solution, continuing the application of the heat with the resulting speeding up of the process so that it is all accomplished in a few days, the length of time depending upon the thickness and the quality of the texture of the hide being treated.

By this method very little of the gelatinous material of the hide is washed away. It is substantially all retained in the hide and made into leather. To hasten the operation after the initial tanning has been applied, the partially tanned hide may be tumbled and flexed in a very strong tannin liquor and by such flexing the tannin is introduced mechanically into the fiber.

As pointed out, by methods of tanning in common use a long time has been taken to accomplish the tanning operation with comparatively weak tan liquor, the final operation being to extract from the tan liquor all the tannin possible and discharge the residue which has become fouled into the sewer and waste it. By my improved method, I begin the tanning with the vegetable tannin with a very strong solution and heat. As the hides are passed from vat to vat the strength of the solution is increased so that the final vat has the strongest solution of all. Because the tanning of the hide is finished in a very strong solution in quick time, the tannin is only partially absorbed from the head vat. Of course, solutions may be passed successively to the same vat in place of passing the hides from one vat to another.

By my process very little of the hide substance is in any way separated to foul the liquor and consequently there is no occasion for waste of the comparatively strong liquor on that account, which results in a very substantial saving. No tanning solution is run off to the sewer.

I desire to claim the invention in its specific form in each instance and I also desire to claim it broadly, as pointed out in the appended claims.

I claim:

1. The process of tanning leather which includes subjecting the hide to a solution containing principally sodium bi-sulphite and water before any treatment of tanning liquor, then subjecting the hide to a solution containing a fast dye for the purpose of establishing an initial color in the hide and then subjecting the hide to a treatment of tanning liquor for the purpose of tanning the hide.

2. The process of tanning leather which includes subjecting the hide to a solution containing principally sodium bi-sulphide and water, then subjecting the hide to a solution of formaldehyde and water before any treatment of tanning liquor, then subjecting the hide to a solution containing a fast dye for the purpose of establishing an initial color in the hide and then subjecting the hide to a treatment of tanning liquor for the purpose of tanning the hide.

3. The process of tanning leather which includes subjecting the hide to a solution containing principally sodium bisulphite and water, then subjecting the hide to a solution containing formaldehyde and a comparatively small proportion of tannin and then subjecting the hide to a treatment of tanning liquors.

4. The process of tanning leather which includes subjecting the hide to a solution containing principally sodium bi-sulphite and water, then subjecting the hide to a solution containing formaldehyde and fast dye and then subjecting the hide to a treatment of tanning liquors.

5. The process of tanning leather which includes subjecting the hide to a solution containing principally sodium bi-sulphite, then subjecting the hide to a solution of formaldehyde and water and a relatively small portion of tannin for the purpose of establishing an initial color to the hide and then subjecting the hide to a treatment of stronger solution for the purpose of tanning the hide.

6. The process of tanning leather which includes subjecting the hide to a solution containing principally sodium bi-sulphite, then subjecting the hide to a solution of formaldehyde and water and a portion of tannin for the purpose of establishing an initial color to the hide, and then subjecting the hide to a treatment of stronger tanning solution for the purpose of tanning the hide.

7. A tanning process which comprises subjecting hides that have been previously limed but which have not been subjected to treatment which will cause liberation of sulphurous acid from a subsequent sodium bisulphite bath, to an aqueous solution of sodium bisulphite to penetrate the hides, remove objectionable surface material therefrom, and substantially neutralize or remove lime remaining in the hides, then subjecting the hides to a solution containing formaldehyde and a comparatively small proportion of tannin, and subsequently subjecting the pretreated hides to a strong tanning solution.

8. A tanning process as set forth in claim 7, wherein the pretreated hides are subjected to a tanning solution having a strength not less than 40° barkometer scale.

9. A tanning process as set forth in claim 7, wherein the pretreated hides are subjected to a strong tanning solution with the application of heat in a series of vats, each succeeding vat containing a stronger solution, whereby the hides are rapidly penetrated and wastage of the tanning solution is minimized.

10. A tanning process which comprises subjecting hides that have been previously limed but which have not been subjected to treatment which will cause liberation of sulphurous acid from a subsequent sodium bisulphite bath, to an aqueous solution of sodium bisulphite to penetrate the hides, remove objectionable surface material therefrom, and substantially neutralize or remove lime remaining in the hides, then subjecting the hides to a solution containing formaldehyde and a comparatively small proportion of tannin, and subsequently subjecting the pretreated hides to a strong tanning solution, and continuing the use of the same tanning solution on successive batches of pretreated hides without the necessity for draining away a portion of the tanning solution after each batch of hides has been treated therein, by reason of the fact that the pretreated hides do not substantially contaminate the tanning solution.

11. A tanning process which comprises subjecting hides that have been previously limed but which have not been subjected to any treatment which will cause liberation of sulphurous acid from a subsequent sodium bisulphite bath, to an aqueous solution consisting principally of sodium bisulphite to penetrate the hides, remove objectionable surface material therefrom, and substantially neutralize or remove any lime remaining in the hides, continuing the treatment until the sodium bisulphite leaves the water and enters the hides, leaving the liquid surrounding the hides substantially clear, then subjecting the hides to a solution containing formaldehyde and a comparatively small proportion of tannin, and subsequently subjecting the pretreated hides to a strong tanning solution, and continuing the use of the same tanning solution on successive batches of pretreated hides without the necessity for draining away a portion of the tanning solution after each batch of hides has been treated therein, by reason of the fact that the pretreated hides do not substantially contaminate the tanning solution.

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