

UNITED STATES PATENT OFFICE.

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TANNING PROCESS.

SPECIFICATION forming part of Letters Patent No. 411,932, dated October 1, 1889.

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To all whom it may concern:

Be it known that I, GEORGE HENRY RUSSELL, a citizen of the United States, residing at Newburg, in the county of Cumberland and State of Pennsylvania, have invented certain new and useful Improvements in Tanning; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a process of tanning, and embodies a mode of treatment by which the hides, before being acted upon by the tanning agent which converts its gelatine and fiber into leather, are treated so that the intercellular spaces may be opened to permit ready ingress of the tanning agent to all parts of the tissues.

In tanning as commonly practiced it is usual to soak the hides in lime and water a sufficient length of time to enable the lime to act on the outer skin and the roots of the hair so that the hair may be removed from the hides. The hides are then treated in various ways to get rid of the lime used in the unhairing process, which if it remains in the hide affects the leather deleteriously by making it dry and liable to crack and making it dark in color. This process, which is called "bating," is usually carried out by treating the hides with manure. The hides are then washed and treated with bark-liquors containing tannic acid to convert them into leather. The distinctive feature of my process resides in dispensing with the manure bate and treating the hide after it has been limed and unhaired with a solution which frees it from the lime, opens the pores, and toughens the tissues, putting the hides into a condition in which they will greedily absorb the tanning principle when immersed in the bark-liquors.

The objects of the invention are to produce a better grade of leather in a shorter time than is possible with the modes of tanning now practiced.

It is well known to the trade that leather made from the skins of the whale and porpoise is finer, smoother, tougher, and more flexible than leather made from the hides of land animals, and it was an attentive inquiry

into the causes of this that led to the development of my process. The whale and porpoise are constantly surrounded by an element containing water, the salts of alkalies, which dissolves the excretory matter of the skins and covers them with a slimy compound. I subject the hides of land animals to conditions analogous to those with which nature surrounds the porpoise and produce a leather that has the durable properties of porpoise-leather, and has its flexibility and toughness to a large degree.

The solution with which I treat the hides consists of water, chloride of sodium, or common salt, bicarbonate of soda, and sulphuric acid. The proportions of these several ingredients may vary, but I find the following to yield the best results:

For seventy-five to one hundred heavy hides take seven hundred gallons of water, seventy pounds of salt, fifty pounds of bicarbonate of soda, twenty-five pounds of sulphuric acid. The salt is first added to the water and the solution agitated until it shows a specific gravity of 5° or 6° on a barkometer. The bicarbonate of soda is then added and the solution then stirred until the soda is dissolved and the mixture shows a specific gravity of from 10° to 12° on the barkometer. The sulphuric acid of commercial standard is then added and the solution stirred until effervescence ceases. The proportions of the several ingredients may be uniformly increased, if desired, to make a solution of greater specific gravity in which the ingredients, except the water, appear in the same relative proportions. The amount of acid will vary slightly accordingly as the resultant solution is desired acid, neutral, or alkaline in reaction. The preferred character of these three conditions depends upon the character of work required. For example, if plump leather of a good weight is wanted, the solution should be neutral, and if fine and soft leather is wanted it should be alkaline. I prefer to have it alkaline for the reason that if it has an acid reaction it reddens the leather and does not expedite tanning as rapidly as when neutral or alkaline. If leather of an extraordinary degree of toughness is desired, the sulphuric acid, before being added to the solution, is

permitted to act on zinc filings, so as to convert the latter into sulphate of zinc. The zinc salt co-operates with the tanning agent when the former is used to give the resultant leather an extraordinary degree of toughness and tensile strength. After mixing the ingredients the solution should be tested in the usual way with litmus paper to determine its reaction, and more acid or carbonate of soda added until it is brought to a neutral state, or preferably made alkaline.

The common practice is to treat the hide in a manure bate until it is depleted and made soft and the lime is thoroughly neutralized. This operation is usually conducted twice, after each bating the hide being well worked on the beam to soften it and to force from the pores the neutralized lime, manure, and dirt. It is then treated with the bate-stone. These operations require three days, and are not only laborious and offensive, but the fiber of the hide is injured by the manure and its grain sometimes spoiled. In my process these treatments are dispensed with, the hides after being unhaired being given one good working out of cold or warm water and then immersed in the bath. I am not prepared to state by exactly what chemical reaction the improved result is brought about. My bath seems to open up the pores and intercellular spaces and thoroughly works out the caustic lime. The hides are thoroughly softened and the grain becomes coated with a slimy substance. For all ordinary purposes a single bath of from 10° to 15° is all that is needed, but where tanning is done on an extensive scale I would prefer a series of baths of graded strength, first, one of 10° to 15°; second, one of 15° to 20°; third, one of 20° to 30°, and keeping the hides a day in each bath, handling them from one to the other.

I have also used a bath in which sulphuric acid was dispensed with, consisting simply of bicarbonate of soda and water, but the leather was deficient in color, weight, texture, and toughness. Or the hides may be successively treated with watery solutions of each of the several ingredients recited—for example, they may be first treated with a watery solution of bicarbonate of soda, then with a solution of salt, and then with water acidulated with sulphuric acid.

The skins of animals consist of gelatine, fibrine, and the animal excretions containing acids and oils. The conversion into leather by the old methods is retarded by the presence of this excretory matter, which is not, so to speak, a base with which the tannic or gallic acids will unite. My treatment frees the skins of these elements and renders the gelatine and fibers a good base for the tanning acids. The treatment by the bath also prevents the formation of gallic acid, and thus not only hastens the process of conversion into leather, but also lengthens the period of usefulness of the bark-liquor. After treating the hides in the bath they are subjected to the action of

the bark-liquors. If great weight is desired, they should be first treated with sour liquors and well plumped, and then tanned in the sweet liquor. I prefer in practice to add a few bucketsful of the solution of double strength to the bark-liquors, as it effectually prevents the formation of gallic acid, and such addition improves the color of the leather, expedites its conversion, and improves its grain.

Hides that are well cured and tight in the hairs may be tanned into furs readily by being handled in the bath until the flesh becomes soft, and then treated with bark-liquors on a graded scale from weakest to strongest.

Bark-liquors are not usually well adapted for tanning furs, as they become hard, but by giving them a preliminary treatment in the bath the furs become exceedingly pliable and tough and are more durable than tawed hides or furs.

In retanning leather it should be first soaked in water and then scoured to get rid of all the sour bark-liquors. It should then be handled in a 10° to 15° bath for twenty-four hours and then treated with bark-liquors.

The time required to tan according to my process will depend somewhat upon the strength of the liquors; but with a solution with the strength hereinbefore described the following results may be expected: Goat, light sheep, and calf skins in from seven to twenty days; heavy sheep and calf skins in from twenty to thirty days; kips in from thirty to sixty days; light hides in from forty to eighty days; heavy hides in from eighty to one hundred and twenty days.

The commercial value of leather depends upon its color largely. Leather made according to my process is plump, fine in grain, finishes with ease during the process of currying and scouring, and will carry more grease than the best bark-tanned leathers, and will hold it in combination with the leather without change of color.

In tanning morocco or kid it is usual to bate the skins in dog-pures and then fill the skins with sumac liquors, sew them up, and pile them in tiers, the liquor being forced into the intercellular spaces of the hides by the hydraulic pressure due to the weight of the filled skins. All of these steps may be dispensed with by treating the skins in the bath described and then immersing them in sumac liquors, or, if preferred, in strong bark-liquor.

Leather made according to my process readily takes embossing and retains it and is especially well adapted to ornamental work. Harness, collar, and shoe leather, belting, shoe-skirting, and russet may be made of a very superior quality. It is not so well adapted for hard sole-leather, but a sole-leather from dry hides may be produced that comes in between the hard and soft grades and makes good belting.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The herein-described improvement in the art of tanning, which consists in first un-
hairing the hides, then dispensing with the
usual manure bates and treating the hides
5 with an alkaline or neutral solution of a salt
of an alkali and sulphuric acid and then treat-
ing them with a tanning agent, substantially
as described.

2. In converting hides into leather, the
10 herein-described process of treating them
with a watery solution of salt, bicarbonate of
soda, and sulphuric acid, substantially in the
proportions specified, and then treating them
with a tanning-liquor.

3. In converting hides into leather, the
15 process of first treating the hides after being
unhaired with a solution containing salt of an
alkali to open the pores and remove the lime,
and then tanning them in liquors containing
20 tannic acid, to which liquors has been added
a watery solution of salt, bicarbonate of soda,
and sulphuric acid.

4. In converting hides into leather, the
process of treating them with a watery solu-
tion of salt, bicarbonate of soda, and sul- 25
phuric acid, and then treating them with a
tanning-liquor containing tannic acid, to which
has been added a watery solution of salt, bi-
carbonate of soda, and sulphuric acid.

5. The improvement in the art of tanning 30
to produce leather of great toughness, which
consists in subjecting the hides to the action
of a solution containing a salt of an alkali,
sulphuric acid, and sulphate of zinc prepara-
tory to treating them with a tanning agent. 35

In testimony whereof I affix my signature in
presence of two witnesses.

GEORGE HENRY RUSSELL.

Witnesses:

JONAS KEEFER,
JENNIE KELSO.