

# UNITED STATES PATENT OFFICE.

OTTO P. AMEND, OF NEW YORK, N. Y.

## PROCESS OF TANNING HIDES OR OTHER ANIMAL TISSUES.

SPECIFICATION forming part of Letters Patent No. 713,046, dated November 11, 1902.

Application filed April 18, 1902. Serial No. 103,580. (No specimens.)

*To all whom it may concern:*

Be it known that I, OTTO P. AMEND, a citizen of the United States, residing in the city, county, and State of New York, have invented a certain new and useful Process for the Tanning of Hides or Other Animal Tissues, of which the following is a specification.

The history of the art of tanning is so well known by those skilled in its application that it is unnecessary to give the details thereof. It may be stated in a general way, however, that at the present time practically only two methods of tanning are employed. One of these is the well-known process in which organic extracts containing tannin are used and the other is that known as "mineral tanning." It is to the latter that my invention relates.

The methods of tanning by means of metallic salts—such as the salts of chromium and iron, for instance—have been known for many years; but such processes are more or less complicated and require a skilled chemist in order to produce good results, while the necessary step of purging in addition to weakening the structure of the skin also requires constant care and attention to prevent destruction of the skin by climatic changes, such as rises in temperature and electrical disturbances. The leather produced by these processes leaves much to be desired in regard to quality, and the time required for the tanning operation is very considerable.

I have discovered that many of the defects inherent in tanning by means of mineral salts are obviated by the employment of a tanning liquor or solution which contains a nitrate of a leather-forming metal and that the time required for the tanning of a skin or hide is very materially shortened. Thus leather tanned in my solutions is superior to that produced by other known metallic processes in that it has a more porous or open texture, owing to less contraction during tanning, and this facilitates the washing out or freeing by any well-known means of any acid which it may contain, while the grain is left in a much better condition for subsequent manipulation or treatment than when produced by the other processes at present employed. Again, I have found that the time

for tanning a hide is so much shortened by using my solutions that an ordinary sheep, goat, or calf skin, which requires immersion from sixteen to eighteen hours in a solution of a basic metallic salt, such as a basic sulfate of chromium or a basic chlorid or acetate of chromium, in order to be tanned, can be tanned in my solution in about one hour, while heavy hides or pelts, such as those of steers, can be effectively tanned by an immersion of, say, twenty-four hours. Still, again, by using my solutions the operation of purging may be entirely dispensed with, and degreasing is so far rendered unnecessary that a hide just as it is taken from the animal after being fleshed and washed may be effectively tanned in my solutions.

If depilation is not desired, liming and bating are also dispensed with and the skin can be thoroughly tanned with the hair in place, while if the hair is to be removed liming and bating may be performed either before or after the skin has been tanned in my solutions. If the skin is to be depilated, and consequently limed, I prefer to remove the lime chemically by washing in a weak solution of an acid, such as muriatic or acetic acid.

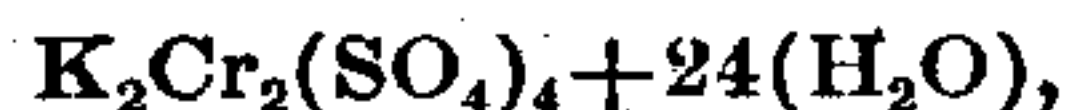
In preparing my solutions of a nitrite of a leather-forming metal I dissolve a salt of one of the leather-forming metals—chromium, iron, aluminum—in water at ordinary temperatures and also dissolve a soluble nitrite of an alkali metal—such as nitrite of sodium, nitrite of potassium, &c.—or of an alkaline earth, such as nitrite of barium, in water at ordinary temperatures and then mix the two solutions to form my tanning solutions. In some cases there will be an insoluble precipitate formed together with a solution of a nitrite of the leather-forming metal contained in the metallic salt, while in other cases no precipitate will be formed; but a partial decomposition takes place with the formation of a nitrite of the leather-forming metal in the solution. In the former instance the precipitate may be removed by filtration or decantation, as is well understood, while in both cases it is the solution containing the nitrite of the leather-forming metal that furnishes the tanning agent.

As illustrations of the first class of solutions, I dissolve seven hundred and seventeen (the



molecular weight) grams of crystalline chromic sulfate,  $\text{Cr}_2(\text{SO}_4)_3 + 18(\text{H}_2\text{O})$ , in about seven thousand grams of water at ordinary temperatures. I also dissolve six hundred and eighty-seven (three times the molecular weight) grams of barium nitrite,  $\text{Ba}(\text{NO}_2)_2$ , in about seven thousand grams of water at ordinary temperatures. I then mix the two solutions and remove the insoluble precipitate. 10 The clear solution will contain nitrite of chromium and is the tanning liquor to be used. Again, I dissolve three hundred and seventy-four (the molecular weight) grams of chromic oxalate,  $\text{Cr}_2(\text{C}_2\text{O}_4)_3$ , in about four thousand 15 grams of water at ordinary temperatures. I also dissolve three hundred and sixty-nine (three times the molecular weight) grams of calcium nitrite,  $\text{Ca}(\text{NO}_2)_2$ , in about four thousand grams of water. I then mix the two solutions and remove the precipitate. The clear 20 solution will contain nitrite of chromium and is the tanning liquor to be used. Of course the salts may be mechanically mixed first and then dissolved in water. I have found four 25 ounces of chromium nitrite to every gallon of water to be an efficient and cheap tanning solution. When, however, the chlorids, acetates, formates, or nitrates of the metals are used with the nitrite of an alkali metal or of 30 an alkaline earth, no precipitate may be formed, but a partial decomposition takes place, forming a metallic nitrite in the solution.

I have also found by experiment that I can 35 form an efficient and cheap tanning solution by the use of chrome-alum,



as follows: I dissolve chrome-alum in, say, 40 ten parts of water at ordinary temperatures and add to this solution a solution of sodium nitrite,  $\text{Na}(\text{NO}_2)$ , in, say, ten parts of water at ordinary temperatures, the proportion of chrome-alum to sodium nitrite being one 45 molecule of the former to six molecules of the latter. A mixture of the two solutions in the proportions of one part of the former to one-half part of the latter will form the tanning solution. There will be no precipitate 50 formed in this solution, but there will be a decomposition with the formation of nitrite of chromium in the solution.

Although I have specified chromium as the leather-forming metal in all of the foregoing 55 examples and prefer to use it, I do not confine myself to the use of the salts of this metal; but my invention includes the use of the salts of the other leather-forming metals, iron and aluminium, and the same proportions and 60 formulas as those above given for the use of chromium will be efficient with iron and aluminium, of course observing the difference in molecular weight; nor do I confine myself to the use of the specific nitrites of the alkali 65 metals named, but include the use of any soluble nitrite of an alkali metal or of an alkaline earth. Neither do I confine myself to

the proportions of water specifically given, because it is obvious that the proportions of water may be varied according to the character of the hides to be tanned and the consequent strength of the liquor desired. The 70 stated proportions in the illustrative examples are efficient for a rapid tanning of an ordinary sheepskin, while a slower tanning 75 may be effected with a weaker solution. Again, with heavier skins, such as those of steers, a stronger solution may be used, and tanning may be effected in eighteen to twenty 80 hours. I may state that I have used effectively, on the one hand, a mixed solution of the two salts each dissolved in seven parts of water, and, on the other hand, a mixed 85 solution of the two salts each dissolved in ninety-nine parts of water. From this it will be understood that the original solutions may be used directly for tanning purposes or as stock solutions which may be diluted with water according to the strength of the tanning liquor desired. 90

In practicing my invention with chrome-alum, for instance, I take for every pound of chrome-alum one-half a pound of nitrite of sodium and dissolve the salts in water in proportions of from one part of the mixed salts 95 to eight parts of water up to one part of the mixed salts to eighty parts of water, according to the strength of the solution desired. I then immerse in this solution the undeepilated skin or pelt which has been previously 100 washed and fleshed, but which has not been cured. (Of course it can be cured, if desired.) The effectiveness of the tanning in chrome-tannage may be determined by the ordinary 105 test of cutting off a piece of a skin in the bath and immersing it in boiling water. If the skin does not shrink, it has been converted into leather. So, also, the other ordinary tests are applied in the case of the other metals.

If depilation is desired, the skin may be 110 limed, depilated, and bated before immersing it in the tanning-bath, or it may be limed, depilated, and bated after being tanned. If the skin is bated, I prefer chemical bating by dissolving the lime in a weak solution of an 115 acid, such as muriatic or acetic acid.

The same process and corresponding stoichiometrical proportions of salts should be used with the other salts of the different 120 leather-forming metals and the nitrites of the alkali metals or of the alkaline earths, so as to form a nitrite of the leather-forming metal. Thus for tanning with chromic sulfate and barium nitrite I take for every one pound of chromic sulfate one pound of barium nitrite 125 and dissolve the salts in water in proportions of from one part of the mixed salts to eight parts of water up to one part of the mixed salts to eighty parts of water, according to the strength of the solution desired, and so on for 130 the other salts of the different leather-forming metals.

Of course my invention contemplates and comprises all methods of introducing into the



bath or generating within the bath a nitrite of a leather-forming metal.

I do not in the present application claim the solutions which form a part of my present invention, as such claims constitute the subject-matter of a divisional application for Letters Patent filed January 25, 1901, Serial No. 44,704.

Having thus described my invention, what I claim is—

1. The process of tanning which consists in exposing the skin or hide to the action of a nitrite of a tanning metal in solution.

2. The process of tanning which consists in exposing the skin or hide to the action of chromium nitrite in solution.

OTTO P. AMEND.

Witnesses:

JAMES M. STEWART,  
JACOB B. TOCH.

Correction in Letters Patent No. 713,046.

It is hereby certified that in Letters Patent No. 713,046, granted November 11, 1902, upon the application of Otto P. Amend, of New York, N. Y., for an improvement in "Processes of Tanning Hides or other Animal Tissues," an error appears in the printed specification requiring correction, as follows: In line 39, page 1, the word "nitrate" should read *nitrite*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of November, A. D., 1902.

[SEAL.]

F. I. ALLEN,  
Commissioner of Patents.

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F. I. ALLEN,  
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