

# UNITED STATES PATENT OFFICE.

JACQUES DURIO, OF TURIN, ITALY, ASSIGNOR TO JOHN F. PLUMMER AND  
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## PROCESS OF TANNING HIDES.

SPECIFICATION forming part of Letters Patent No. 562,781, dated June 23, 1896.

Application filed January 31, 1896. Serial No. 577,610. (No specimens.) Patented in Italy March 6, 1893, No. 66/76; in England April 21, 1893, No. 16,783; in France June 7, 1894, No. 228,500; in Austria June 23, 1894, No. 13,030; in Hungary June 23, 1894, No. 24,097, and in Belgium August 31, 1894, No. 106,034.

*To all whom it may concern:*

Be it known that I, JACQUES DURIO, a subject of the King of Italy, residing at Turin, Italy, have invented certain new and useful  
5 Improvements in Processes of Tanning Hides, set forth in the following Letters Patent, namely: Italian Patent No. 66/76, applied for March 6, 1893, granted March 20, 1893, and dated March 31, 1893; English Patent No.  
10 16,783, dated April 21, 1893; French Patent No. 228,500, dated June 7, 1894; Austrian Patent No. 13,030, and Hungarian Patent No. 24,097, both dated June 23, 1894, and Belgian Patent No. 106,034, dated August 31, 1894,  
15 of which the following is a specification.

In the tanning of hides as carried on in the practice of the art as hitherto generally conducted, the necessity of allowing the hides to remain for long periods of time in the tan-pit  
20 has, when operations have been conducted on a large scale, involved the investment of a great amount of money, in that a large plant has been required to afford the space necessary for the number of pits it has been essential to use, and in that during the many months  
25 elapsing between the purchase of the hides and the completion of the tanning operation the capital invested in the hides is practically idle. It is a great desideratum therefore that the process of tanning hides should be carried  
30 on in such a manner as both to dispense with the necessity of large and expensive plants and to abridge the period of time required in the conduct of the tanning operation.

In my process the hides to be tanned are first unhaird and fleshed in any usual manner, as by resort to the lime bath, a step well known to those familiar with the art. Immediately after the completion of the unhairing  
40 and fleshing operation, I place the hides in a bath of hydrate of soda, or soda-ash, employing of water four times the weight of the hides and of the hydrate one to four per cent. of the weight of the hides, and the hides are allowed  
45 to remain in this bath for from three to six hours. The hides are given this hydrate of soda bath for the double purpose of removing as much as possible of the lime which has adhered to them, and of simultaneously dissolv-

ing out from them as much as possible of the 50 fatty matters naturally inhering in or adhering to the same. The hides are then washed by an energetic fulling or drumming operation, with pure water, in the same vessel if desired, the result of which is that by the action 55 of the water and by the manipulation of the hides the latter are caused to expel from their pores a large proportion of the lime and the fatty and other foreign matters. After the fulling or drumming, the operation of removing the lime, fatty matters, and hydrate of 60 soda, or other foreign matters or impurities, is continued by subjecting said hides to a very careful purging or scudding. After allowing the hides to remain in a bath of water for a 65 period of, say, twelve hours, I pile them one on another to drain, allowing the draining operation to continue for, say, ten hours. I then, to free the hides from grease, subject them to the action of benzene, or turpentine, 70 or other solvent, preferably by placing said hides in a drum with the solvent and rotating the drum to effect a fulling action upon the hides. This operation lasts about two 75 hours. The solvent, being of extreme fluidity, rapidly permeates the interior of the hides and displaces, forces, or draws out, by physical or chemical action, a further amount of grease or other impure substances, which, floated, so to speak, to the surfaces of the 80 hides, form a deposit in the nature of a coating thereon. After the formation of this deposit or coating, preferably while the drum is still rotating, I perform the final step of the preparatory stage of the process, which re- 85 sides in the addition to the mass within the drum of a quantity, from one-tenth to one-fifth of the weight of the hides, of pure tannic extract, and continue the rotation of the drum for a period of one-half hour to one 90 hour. The tannic extract introduced to the mass within the drum effects an incipient or preparatory tanning of the hides.

The impurities are by the last-described operation separated from the hides, and then 95 removed from the drum, the hides being left free from grease, lime, and foreign matters, with their pores well dilated, and the texture

and fiber of the hide well prepared for the final tanning stage of the process, which I now proceed to describe.

The hides conveniently still remain in the drum, and I now introduce to the drum a quantity of pure tannic extract proportionate to the area of the drum and the quantity of hides contained therein, and rotate the drum to subject the hides to a fulling operation, and continue this operation until the hides are completely tanned, the period varying from two to eighteen hours according to the thickness of the hides treated.

Instead of subjecting the hides to a preferred preparatory treatment with tannic extract and then to a final treatment with said extract, as has been described, my process may be performed by treating the hides with tannic extract introduced thereto at intervals, from time to time, or it may be performed by subjecting said hides to tannic extract applied in one operation. The result generally obtained, however, by the last-named mode of operation is less satisfactory than the result obtained by the others, as I believe that a better quality of leather is produced by subjecting the hides to a preliminary tanning operation either by a preliminary treatment with tannic extract, as in the preferred mode, or by the treatment of the hides from time to time, at intervals, with the extract, as described in the second operation.

When the hides are removed from the drum, they will be found, notwithstanding the brevity of their exposure to the tanning extract, thoroughly and uniformly tanned, and the product, even in the case of the heaviest hides, will be of the finest and most salable and durable character.

I am unable to state the rationale of the effects which are by the practice of my invention produced on the leather; but at this time it is only necessary to say that I obtain a new result never heretofore attained in the practice of the art.

In the tanning operations as heretofore carried on it has been usual to employ a tanning material known as "tannic" solution or liquor. This tannic solution is commonly made by adding water to commercially pure tannic extract.

It has heretofore been supposed that commercially pure tannic extract without the admixture of water therewith, or tannic solution therewith, could not be successfully employed in tanning operations to produce good leather.

I have discovered that the time of the tanning operation may be materially shortened, the cost incident thereto be materially lessened, and the quality of the resultant leather be materially improved by using tannic extract in contradistinction to tannic solutions or liquors as the tanning agent, and the use of tannic extract as contradistinguished from tannic solution or liquors is essential to my process.

By the expression "tannic extract" herein

employed, I refer to the well-known article of commerce dealt and referred to in the trade by that name, the same being an infusion or leech of a suitable vegetable substance, such as chestnut-wood, oak-bark, &c., concentrated by evaporation.

By the expression "tannic solutions," I refer both to the unconcentrated infusion or leech, and to the tannic extract, as above defined, when diluted or admixed with water.

From experiment and observation I believe that in the process of concentration by evaporation a chemical combination is effected of the gums, reds, and tannates present in the mass, forming an extract quite clear of any insoluble substances, that in such tannic solutions as are constituted merely by the unevaporated and unconcentrated infusion or leech of the bark, this chemical combination is not formed, and, in such tannic solutions as are formed by the addition of water to the extract, this chemical combination is destroyed, with the result that a part of the tannic acid will become decomposed and in many cases form a precipitate, thus not only diminishing the available strength of the acid, but by the presence of insolubles decrease its fluidity and therefore its property of penetrating the infinitesimal pores of the hides.

The addition of the water to the tannic extract results in the chemical or physical disintegration of the extract and the precipitation of certain constituent elements thereof, so that the decreased fluidity of the extract and the diminished active tannin or other astringent tanning principle thereof render it a much less effective tanning agent than the tannic extract from which it has been made. It will thus appear that in the process of tanning by the use of tannic solutions there is a consequent loss, which is due on the one hand to the precipitation by the addition of water to the tanning extract of substances which by precipitation become inert and inactive in the tanning operation, and on the other hand to a decreased weight in leather by reason of the diminished quantity of astringent or tannic principle remaining in the solution as compared to that contained in the original extract from which it was prepared. The advantages therefore incident to the use of tannic extract as opposed to tannic solutions are a decrease in the time necessary for the tanning operation, an improvement in the quality of the leather produced, a material saving in the quantity of tanning extract or agent necessary to be employed, and an increased weight of leather produced.

Another advantage incident to the use of the tannic extract as opposed to the use of tannic solution is that in the tanning operations with the use of solutions it has been usually necessary to throw away and lose a great portion of the tannic solution remaining at the end of the tanning operation, not only by reason of the fact that it contains precipitates and impurities incident to the

admixture of water with extract to form said solution, but also by reason of the fact that the water in said solution and the contained impurities in it occasion the further deterioration of the solution, so as to render it unfit for use in a tanning operation subsequent to the first few operations in which it is employed. In the use of tannic extract, in my process, it is found that the extract remaining at the end of a given tanning operation is sufficiently clean, pure, and strong to be well suited for use in subsequent tanning operations, from which it results that the tannic extract at the end of the tanning operation need not be thrown away and become waste material, but may be further repeatedly utilized and thus effect a large saving of expense.

I am aware that it has been proposed to tan hides by subjecting them to what is termed "abnormally strong tannic-acid solutions" of a preferred strength of from 8° to 20° Baumé, and in contemporaneously tumbling said hides; but to such a process, involving as it does the use of tanning solutions, I lay no claim.

Having thus described my invention, I claim—

1. In the art of tanning hides by treatment with fluid tannic extract, the process of preparing said hides for said treatment, which consists in subjecting them to a bath of, or to treatment with, hydrate of soda, or equivalent lime solvent, and to a bath of, or to treatment with, benzene, or equivalent grease solvent, and to a brief preliminary bath of, or treatment with, tannic extract, substantially as and for the purposes specified.

2. The improvement in the art of tanning hides which consists in subjecting them to a bath of, or to treatment with, hydrate of soda, or equivalent lime solvent, to a bath of, or to treatment with, benzene, or equivalent grease

solvent, to a preliminary bath of, or to treatment with, fluid tannic extract, and in then subjecting said hides to the action of tannic extract and in contemporaneously tumbling or agitating said hides, substantially as and for the purposes specified.

3. The improvement in the art of tanning hides, which consists in subjecting them after they have been subjected to a suitable preparatory treatment for the removal of lime, grease, and impurities therefrom, to a bath of, or to treatment with, fluid tannic extract, and in contemporaneously tumbling or agitating said hides, substantially as and for the purpose specified.

4. The improvement in the art of tanning hides, which consists in subjecting them to a preparatory treatment whereby the lime, grease and other impurities are removed therefrom and a protective coating formed upon their surfaces, and in then subjecting said hides to a bath of, or to treatment with, fluid tannic extract and contemporaneously tumbling or agitating them, substantially as and for the purposes specified.

5. The improvement in the art of tanning hides which consists in subjecting them, after they have been subjected to a suitable preparatory treatment for the removal of lime, grease, and impurities therefrom, to a bath of, or to treatment with, fluid tannic extract, said extract being introduced to the hides from time to time, and in contemporaneously tumbling or agitating said hides, substantially as and for the purpose specified.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 21st day of January, A. D. 1896.

JACQUES DURIO.

In presence of—

WM. C. STRAWBRIDGE,  
JNO. F. PLUMMER.