

B. SCHWERIN.
PROCESS FOR TANNING AND IMPREGNATING MATERIALS BY MEANS OF ELECTRICITY.
APPLICATION FILED SEPT. 8, 1914.

1,229,150.

Patented June 5, 1917.

Fig.1.

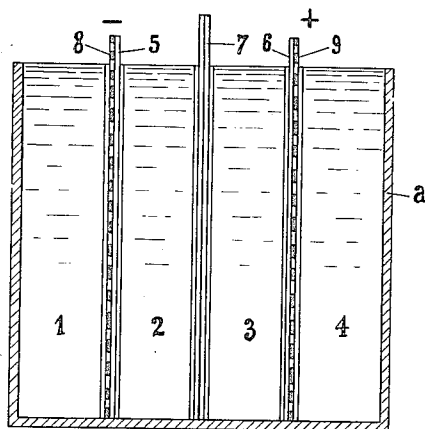


Fig.2.

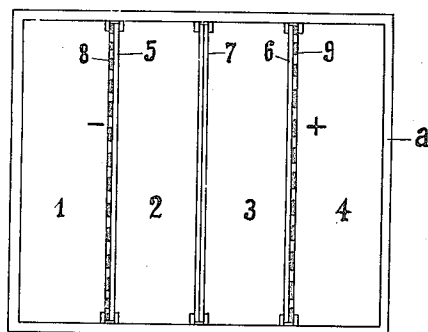
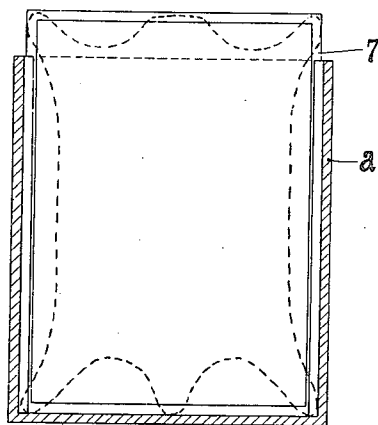


Fig.3.



Witnesses:
R. H. Trognor.

E. H. Abram.

Inventor:
B. Schwerin
BY *Mason Fenwick Lawrence,*
his Attys.

UNITED STATES PATENT OFFICE.

BOTHO SCHWERIN, OF FRANKFORT-ON-THE-MAIN, GERMANY, ASSIGNOR TO ELEKTRO-OSMOSE AKTIENGESellschaft, (GRAF SCHWERIN GESELLSCHAFT,) OF BERLIN, GERMANY, A CORPORATION.

PROCESS FOR TANNING AND IMPREGNATING MATERIALS BY MEANS OF ELECTRICITY.

1,229,150.

Specification of Letters Patent.

Patented June 5, 1917.

Application filed September 8, 1914. Serial No. 860,731.

To all whom it may concern:

Be it known that I, BOTHO SCHWERIN, a subject of the German Emperor, residing at Frankfort-on-the-Main, Germany, have invented certain new and useful Improvements in Processes for Tanning and Impregnating Materials by Means of Electricity, of which the following is a specification.

This invention relates to a process for tanning, impregnating, dyeing superficially or throughout and like treatment of materials with aid of electricity. By way of illustrating the invention there is described in the sequel its application to tanning skins or hides with tannin, though it is applicable, so far as the art of tanning is concerned, also when other tanning agents, such as quebracho or chromium compounds are used.

The invention utilizes the fact that a tanning liquor may be carried through the hide by the electric current, that is to say electro-osmotically, whereby the hide is able to take up the tannin and become converted into leather.

Many processes have been proposed for tanning with aid of electricity, but hitherto none of these has come into practice. The reason is that the tanning operation has always been attributed to a purely chemical operation, for instance to the action of nascent hydrogen and oxygen; or that, although the possibility of electro-osmotic treatment has been recognized, the conditions suitable for electro-osmosis have not been attained. It has been proved that tannin is decomposed by the electric current, but a suitable counteracting agent has not become known. Finally, the most obvious expedient for preventing such decomposition, namely the use of alternating current, is inimical to electro-osmosis.

The present invention avoids all the phenomena which hinder the attainment of the object in question and provides a practicable and rapid tanning process.

The transport of the active substance, in this case tannin, into or through the material, in this case skin or hide, under treatment is effected by subjecting the material and the liquid containing the active substance to the action of the electric current between diaphragms. When operating with a liquid free from substances that hinder

electro-osmosis, the material to be tanned or impregnated may be suspended on the walls within the space between the diaphragms without tight inclosure and the circulation of the liquid may be aided by stirring or the like. In general the diaphragms should be selected of such electric charge that they permit the constituents which injuriously effect the electro-osmosis to migrate, while retaining the active substance. In this case the constituents which injuriously affect the electro-osmosis migrate through the diaphragms and are thus separated from the liquid, while decomposition of the active substance (for example, tannin) at the pole does not occur. In a tanning liquor the constituents which injuriously affect the electro-osmosis are those electrolytes which check or entirely prevent the migration of the tannin. The process may be so conducted that before the actual tanning, impregnation or the like, the substances which hinder or prevent the operation are removed from the material by electro-osmotic de-adsorption and an electrical charge of character corresponding with the active constituent imparted to the material. The material is then preferably arranged as a partition dividing the space between the diaphragms, when it acts itself as a diaphragm and permits migration of the active substance. For example, in tanning hide with tannin an electropositive character should be imparted to the hide, and an electronegative character when tanning with chromium compounds.

By observing these conditions the tannin solution can be caused to migrate electro-osmotically through the hide, whereby the latter becomes leather, the degree of tannage being apparently dependent on the concentration of the liquor and on the tension of the electric current used.

The special case of tanning hide with tannin will be further explained. The hide is assumed to have been plumped with lime.

In the drawings, Figure 1 is a vertical section through a receptacle for holding the liquid, showing diaphragms mounted therein; Fig. 2 is a plan view; Fig. 3 is a vertical section at right angles to the section of Fig. 1, and showing a hide stretched in a frame.

In the several views, *a* is a vessel of suitable form, subdivided into 4 compartments, namely by the diaphragms 5, 6 into a middle

compartment and two side compartments, the middle compartment being further subdivided into compartments 2 and 3 by the hide 7 which is stretched in a frame either directly or with use of a support. Behind the diaphragms are arranged the preferably perforated poles 8 and 9, in such a manner that they are in contact with the diaphragms. The latter may consist of a cellulose preparation, like parchment paper or viscose. The cathode chamber 1 and the anode chamber 4, are filled with water, which, in order to avoid resistance, preferably contains traces of caustic soda in the cathode chamber and of sulfuric acid in the anode chamber. In the anodic middle chamber there is water, in the cathodic middle chamber a dilute acid suitable for de-liming hide. When the electrodes are connected with the poles of a source of electric current, the hide is first purified in that the lime and other basic residues migrate out of it and pass into the cathode chamber through the feebly negative diaphragm. By this treatment the hide is caused to fall, and at the same time to become gradually of stronger electro-positive character. The first stage of the treatment is at an end when the de-adsorption of the basic residues is complete.

The tanning liquor is now charged into the chamber in front of the cathode. By the action of the electric current those cathodic constituents which could hinder the osmosis migrate through the cathodic diaphragm. On the other hand, the negative ions which prevent or limit the migration of the tannin migrate first through the hide and then into the anode chamber through the indifferent diaphragm.

Proportionally to this progressive purification of the tannin liquor, the solution of the tannin migrates through the hide and appears in the middle chamber 3, whence the solution is withdrawn. After it has been replenished it can be used again. This has the advantage that the longer the tanning liquor is used the purer it is.

The anodic diaphragm must have such a potential that the actual ions can migrate through it, while the tannin cannot. If pure tannic acid solution, which contains no ions that can hinder osmosis, is used from the beginning, the hide need not be stretched in the middle chamber but merely suspended therein. Circulation of the tanning liquor by stirring is then permissible.

If an impure tanning liquor contains acid residues, the osmosis of the tannin solution will not occur until the acid residues have passed the hide in order to be separated by the anodic diaphragm. If now by stirring the acid residues are again brought around to the cathode side, the migration of the tannin solution and therefore the tanning will be more or less delayed. So also basic residues

which are brought by stirring to the anode side of the hide, act to diminish the electric charge of the hide by back-migration, and this is obviously accompanied by a delay of the migration of the tannin. In impure tannin solutions, therefore, the hide must be stretched.

The following experiment may be cited:—

A goat skin was stretched in the osmose apparatus shown and subjected to osmosis by a tannin solution of 5 per cent. strength from the cathodic middle chamber. After about 5–10 minutes the tannin could be detected in the anodic middle chamber. In about half an hour the skin was fully tanned. The liquid transferred by cataphoresis from the cathodic to the anodic middle chamber amounted to about 500 cc. per hour. The necessary current data are on an average 1 ampere at 100 volts per square decimeter of anode surface.

The general applicability of the facts on which this new process is based permits of its general use. All problems may be solved by it, which relate to the introduction into certain materials electro-osmotically of other constituents under like experimental conditions, for example in cases of adsorption, dyeing superficially or throughout, tanning and impregnating.

Having thus described the nature of my said invention and the best means I know of carrying the same into practical effect, I claim:—

1. A process for introducing a substance into or onto a material, which process consists in confining the material and a liquid containing the substance in question between diaphragms of such electric charge that they permit migration through them of constituents of the liquid which injuriously affect electro-osmosis while retaining the substance in question, and passing an electric current through the liquid and diaphragm.

2. A process for introducing a substance into or onto a material, which process consists in first separating electro-osmotically by de-adsorption from the material constituents which hinder the introduction and then confining the material and a liquid containing the substance in question between diaphragms and passing an electric current through the liquid and diaphragms.

3. A process of introducing a substance into or onto a material, which process consists in confining the material as a partition dividing the space between diaphragms in a bath of liquid containing the substance in question, and passing an electric current through the liquid and diaphragms.

4. The process herein described which consists in introducing water into the chamber of a receptacle between one side of a hide disposed therein and a diaphragm of cellulose or the like, introducing dilute acid into

a chamber between the hide and a negative diaphragm, passing a direct current between the diaphragms and causing the hide to become more strongly electro-positive, the
5 basic residues passing through the negative diaphragm, charging a tanning liquor into a chamber between the cathode and the wall of the receptacle, causing the cathodic constituents to migrate through the cathodic
10 diaphragm and the negative ions to migrate through the hide and the diaphragm first

mentioned, and the tanning liquor to pass through the hide, and finally withdrawing the liquor from the chamber between the hide and the diaphragm first mentioned.

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

15

BOTHO SCHWERIN.

Witnesses:

JEAN GRUND,
CARL GRUND.