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For the Scientific American.

On Tanning Leather.—Preparation of Hides.

The art of preparing leather is very ancient, and is practised in every country on the face of the globe, with a general similarity of method, the result of obvious reasoning and long experience.

The objects fulfilled in converting skin into leather, are to prevent the destruction by putrefaction, which unprepared skin would undergo, and to render it strong, tough and durable, and in some instances impervious to moisture.

The skin stripped off an animal consists principally of the true cutis, or membraneous texture; the chemical composition of which is gelatin in a dense state, but still entirely soluble in water, more or less easily, according to its density. This however is penetrated with different vessels for blood, lymph, oil, &c., some of the contents of which remain after the death of the animal, and is covered on the outside with the insensible cuticle, to which is attached the exterior covering of hair, wool, fur and the like. The chemical composition of the cuticle and hairy covering appears to be condensed albumen, insoluble in water, and nearly incapable itself of putrefaction, but readily separable from the true skin by slight mechanical violence, after the adhesion has been weakened by incipient fermentation or putrefaction, or the chemical action of lime, alkalies, or acids.

The preliminary steps of all the processes for making leather consist in separating from the cutis, adhering impurities and foreign matters, the animal juices retained in its pores, and the cuticle with its hairy covering; (except when the latter is purposely left on.) The true skin being thus obtained nearly pure, and its texture so far opened as readily to imbibe any substance in which it is macerated, is then converted into leather in different methods, of which there are two quite distinct from each other; namely, that of tanning or impregnating it with the peculiar vegetable matter called tan; and tawing, in which it imbibes alum and other salts, and afterwards some soluble animal matter, such as the white of egg, or sometimes blood. These two processes are also sometimes combined, that is, first by tawing, and aftewards finishing with a slight tanning. A large portion of the tanned leather also undergoes the further operation of currying, or imbuing with oil of some kind, with much manual labor, in order to render it supple, flexible, and still more impenetrable by water. As familiar examples of each, the thick sole leather of shoes is tanned; the white kid leather, as it is called, for fine gloves, is tawed; the upper leather for boots and shoes, is tanned and curried; and the fine Turkey leather is tawed, and afterwards finished with a slight tanning.

All the skins undergo a considerable preparation before they are fit to receive the tanning solution. In most parts the process is the following, for the thin skins of cows, calves, and those that are used for the more flexible kinds of leather; most of which is afterwards finished by currying; the hide is first thrown into a pit with water alone, to free it from loose dirt, blood, and other impurities. After laying there for a day or two, it is placed upon a solid half cylinder of wood or stone, called a beam, where it is cleared of any adhering fat or flesh. It is then thrown into a pit containing lime and water, in which it is kept for several days, with frequent stirring. The use of this is to loosen the hair and cuticle; after which the hide is again stretched on the beam and the hair entirely scraped off with a blunt knife made for the purpose. In some tanneries the hair is loosened without the use of lime, the skins are piled together and covered with spent bark; in this situation a fermentation takes place, which so far decomposes the cuticle, as to allow the hair to be easily scraped off. Great care is required in its management, for if the fermentation is allowed to proceed too far, the texture of the skin will be injured. The length of time required for the completion of this process, varies with the weather and other circumstances; the pile is frequently examined, and the skins removed as soon as the hair is loosened. The hide being well freed from the lime, is then put into a pit called the mastering pit; which is a bath composed of water and the dung of some animal, generally hens, pigeons, dogs, or, when it can be had, of sea-fowl, diffused through the water. The dung of horses or cows will not answer, not being sufficiently putrescent. Here the hide remains for some days, more or less, according to its texture; and from being hard and thick it becomes very soft and supple.—Where the hide is very thin and fine, extreme care is requisite in regulating this part of the process; for the putrescent dung is found so powerful an agent, that if the skin is kept in it only a few hours too long its texture is irrecoverably destroyed, and it is reduced to a gelatinous mass, which pulls to pieces with the slightest force. The hide is then thoroughly cleaned on the beam, and is fit for tanning.

The large thick ox hides, intended for the toughest sole leather, or where a very strong leather is required, are prepared in a different way. Being first cleaned in water, they are rolled up in heaps, and put into a warm place, where they speedily begin to putrify. The hair is then loosened, and may be scraped off sometimes with, and at other times without, the process of liming. The reason why the liming is generally omitted is, that the lime, if retained in the skin, renders it too hard and liable to crack; and it is not so easy to wash it out from these, as from the thinner hides. But on account of the thickness of the hide, and the closeness of its texture, it is not fitted to receive the tan liquor till its pores are more completely opened; and this is usually done by immersing it for several days in a vat containing a sour liquor, an impure acetous acid, formed from rye or barley flour, strongly fermented. The acid generated in the process, seems to be a principal agent in opening the texture of the skin; but this is, doubtless, assisted by the continuance of the fermentation, of which the skin itself partakes. This process is called raising, and it always immediately precedes that of tanning. Here, also, much care is required not to weaken the texture of the skin too much, for if kept too long in this process, it would be corroded and spoiled. The hide comes out of this bath considerably swelled and softened.

Instead of this part of the process, which is often difficult to manage properly, on account of the effect of the weather, and other external causes, on the necessary fermentation; sulphuric acid, extremely diluted, may be used. The proportions employed, are about a wine pint of oil of vitriol to fifty gallons of water. Though the vitriolic bath is found to have as good an effect as the rye and barley sourings, in preparing the hide for the tan, the action of the two substances seems to be considerably different. In the latter the acetous acid is doubtless the chief agent, but the fermentation still continues, as is proved by the readiness with which the skins are rotted, if this is too high or too long continued. The skin also, after raising in this way, is thickened and softened. But the vitriolic bath is incompatible with any fermentation, and most powerfully checks this process, and hence the skin is not readily spoiled by very long immersion, and it comes out thickened and hardened. It should seem, however, that each method answers perfectly well.

Note—We intend to publish a series of articles on this most important (and always will be important) art, so as to present all that is useful and new to our readers, and which taken altogether, will form the best essays on the subject ever published.

The Cumberland (Md.) Civilian says that there exists in the vicinity of that place an inexhaustible supply of sand for the manufacture of glass, that is not surpassed, in every essential quality, by any to be found in the United States.

Another great sale of Camel's hair shawls took place in this city on the 21st instant.—The lowest price was fifteen dollars—the highest $550.

History of Propellers and Steam Navigation.

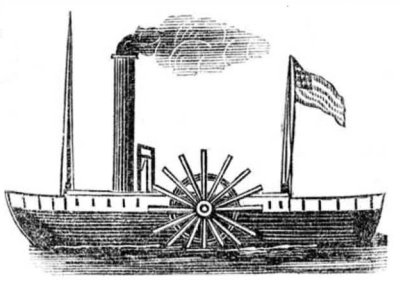
[Continued from page 112.]

OLIVER, EVANS, COL. STEVENSON, ROBERT FULTON.

It is stated that Oliver Evans published, in 1785, an account of a mode to propel vessels with paddle wheels, by his high pressure engines, and although Galloway states that he believes that "he fully establishes his claim to the first practical steamboat," still we have no correct evidence to establish the truth of this statement. Neither Rumsey nor Fitch mentions his claims in their pamphlets, nor have we any evidence that he ever built a boat except his *Orukter Amphibolis* or Mud Scraper; but he was a most ingenious man.

In 1804, Mr. Stevens, of Hoboken, N. Y., made a number of trips on the North River with a small boat 25 feet long, which was propelled by a wheel at the stern. Mr. Stevens first tried a rotary engine, but it would not answer, and then he tried one like Watt's, which propelled his boat at the rate of four miles an hour, and it even run at the rate of eight miles per hour for a short distance. Stevens rendered an important service to the engineering world, by his invention of the tubular boiler, which he patented, and which, as a suggestion at least, has been the means of working wonders, for in a boiler 6 feet long, 4 feet wide, and 2 feet deep, he exposed 400 feet of surface in the most advantageous manner to the action of the fire.

Fig. 10.—The Claremont.



While Fitch, Oliver Evans and John Stevens, were prosecuting their experiments in steam engines and steamboats in America, Robert Fulton was in Europe studying and experimenting on the same subject. He left Philadelphia in 1786 and went to London, and in 1793 he communicated with the Earl of Stanhope about steamboats, and he published a very neat work on the subject in 1796. The Earl of Stanhope was a very ingenious nobleman, and proposed to propel the boat by what was called the Duck-foot propeller, which was simply a kind of a broad blade that opened when acting against the water—it being pushed behind the boat on a rod or foot, and closed by the action of the water when drawn back. In this same year Fulton went to France, where he brought the subject before the French Directory, and the Minister of Marine. He also proposed to build his Nautilus to "deliver France and the whole world from British oppression." In 1801 he tried his Nautilus at Brest, under the favor of Napoleon, and remained under water for four hours and a half, but he never blew up a single enemy's ship.

It was in France, where Fulton was introduced to Mr. Livingston, his countryman, who in 1803 assisted Fulton to complete a boat 66 feet long, to be propelled with paddle wheels, on the Seine. From the number of experiments which Fulton had made before, we believe, that Mr. Livingston, in all likelihood, made some good suggestions to him in the building of this boat, for this experiment fully established the confidence of both the projectors, and they at once ordered an engine to be built by Bolton & Watt, in England, to be forwarded to New York, to introduce the steamboat on American waters. Livingston succeeded in getting a patent from New York to navigate all its waters by steam for twenty years. Fulton arrived in New York in Dec., 1806, and in 1807 his steamboat, the Clermont, was launched on the East River, and although in the course of its erection it was called "Fulton's Folly," and he was looked upon as a man beside himself, yet his vessel had not proceeded one hundred yards from the shore before the incredulous multitude who had assembled to witness its failure, were convinced of its utility, and from them were extorted renewed cheers. This vessel made regular trips to Albany, and it may be said that from the first stroke of her paddles, steam navigation has never ceased for a single day. She established regular steam navigation. She made her first trip to Albany in 32 hours, being at the rate of five miles per hour. The Clermont was 160 tons. The cylinder was 24 inches in diameter and 4 feet stroke.

Some have endeavored to tarnish the fame of Fulton, by endeavoring to rob him of all honor or merit; but he deserves great praise, and his memory will always be respected by every impartial person who looks back upon the works which he accomplished. Until the period of the Clermont's first trial, we have seen that the subject of steam navigation had been brought before the public, at various periods, in different parts of the world, from 1736. The advancements made in the art may be said to have been gradual, one inventor profiting by the failures of his predecessor, and surely we must give credit to that sagacity that perceives how to remedy a defect. Until James Watt improved the steam engine, and made it double acting, no steamboat was successful, and when we consider that he built the engine of the Clermont—the first successful boat—we cannot shut our eyes to his merits in connection with improvements in steam navigation.

It very often happens that a good idea is embraced in a new invention—a new principle of action developed; but it also often happens that there is some great fault in carrying it into execution; we are, somehow or other, very liable to make blunders, and only get our wisdom in a negative manner, by dear bought experience; and in the case of steam navigation let the *honest* historian state facts in such a manner as not to adorn the character of one inventor at the expense of another.

LITERARY NOTICES.

Southern Cultivator.—This is a valuable monthly agricultural periodical, published at Augusta, Ga.; D. Lee, M. D., Editor. It is well conducted and ably edited.

The Prairie Farmer—Published by Messrs. J. S. and J. A. Wright, of Chicago, Ill., commences its new volume on the first of next month. It is a truly useful Magazine for our Western farmers.

The Great Metropolis—H. Wilson Publisher, 251 Pearl street. This the title of a very neat volume of Astronomical Calculation for 1850, accompanied by a map and a running glance at this city, with illustrations of several churches and other prominent buildings.

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