hair-sheath having been dissolved, and at the same time the scarf-skin with the hair is scraped off upon a sloping rest, with a species of knife with two handles. The lime has also combined with the fat of the hide to form a calcareous soap, to dissolve which, and the excess of lime, it is well washed, sometimes in a running stream. The hide is fleshed, or deprived of the loose or extraneous flesh or cellular tis­sue; and if butts are to be made, the head, shoulder, and bellies are cut off. The central part or butt weighs about two thirds of the whole leather. The hair was for­merly taken off by making a sour liquor from fermented vegetable matter, in which the hide lay for several days ; they were also smoked in a damp state for the same pur­pose ; but both those methods are now abandoned. They are still sometimes sweated, that is, they are laid in heaps, kept wet and warm : but in America the sweating is per­formed cold ; the hides are hung up wet in a damp under­ground cellar, and are kept wet for ten days or a fort­night. In either of the three last processes, incipient putre­faction takes place sooner or later, when the hair and scarf- skin are easily removed ; but the fatty matter remains, and in some cases prevents the hide from taking the tan. The tanning either follows at once, or is preceded by what is called abating or grainering. For this process, a quantity of pigeon’s dung is steeped in water. In this mixture the hides are steeped for a week or ten days, with occasional removals and strikings. The excess of lime is removed by the lithic acid of the dung ; and the ammonia generated by the pu­trefaction of the mixture tends to form an ammoniacal soap with any remaining fat of the hide : but as the gelatine of the hide exists in two states ; one, the principal, hard, or fibrous portion,—and the other (which is more soluble) con­tained between the fibres, and more affected by agents and putrefaction ; this softer portion is removed by grainering, and the leather, when tanned, is light and porous, and more readily permeable to water.

Some tanners are anxious that their leather should look thick when completed. To “ raise” the hide, they use a solu­tion of sulphuric acid, containing 1/500th part of acid: in this the hides remain ten or twelve hours, when they are found to be thickened, or to have substance ; but as nothing is added to the gelatine by the process, it is only the appearance which is altered, and no difference of thickness is found in the leather after it has been under the shoemaker’s hammer.

The hide or skin thus prepared is ready for tanning. For­merly in England, and at present on the continent, it is done by stratification. A bed of bark is made upon the bot­tom of the pit ; upon this is laid the hide, then bark, then a hide, until the pit is full ; water is sometimes pumped in, and the pit left for some months ; it is then emptied, and the same hides returned with fresh bark and water for a few months longer : this is repeated again and again, until the tanning is completed ; the time varying from one to four years for heavy leather.

About the end of the eighteenth century, Seguin profess­ed to give a theory of tanning. He showed that astringent solutions contained gallic acid, which precipitated sulphate of iron black, but did not precipitate gelatine ; whereas the tannin present threw down gelatine as well as sul­phate of iron ; and from this he deduced that leather was a compound of gelatine and tannin. Upon this he founded a new process. He recommended solutions of tannin, made by pumping water successively upon the vegetable used, contained in latches or spenders, until it arrived at as great a degree of strength as the series of spenders permitted. In this way he was continually throwing away some bark as expended, and replacing it with fresh, which was next to be the strongest tap.

This is the plan now generally followed in England ; but in practice it is varied, some using ground bark only, others terra japonica, valonia, or divi-divi, or mixtures of two or more ; some using steam to facilitate the solution, others steaming only the backward latches ; and some using only cold water. In some yards clean water only is used to ex­tract the soluble matter, while in others the ooze, exhausted as much as it can be by hides, is made to perform the office instead of water. Every tanner has also his own particular strength of liquor to work at, the strongest being about sixty degrees, while others do not go beyond ten degrees. It is these variations which cause so great a variety among the samples of leather in the market.@@1

This improvement of Seguin proved a most important one ; and although not equal in practice to his original ideas, yet it has shortened the period to about half of that pre­viously occupied. The principal difficulty experienced in its use occurs in the estimation of the real quantity of tan­ning material actually in solution. He proposed the use of a solution of gelatine, isinglass, or glue, which was to be dropped into the fluid as a test of the presence of the tannin. In the hands of an experienced chemist this is a tolerable means of arriving at the quantity ; but it proved too difficult for the tanner of the day. He therefore judges by the astringent taste of the solution, and its darkness of colour ; or depends upon its strength from a certain weight of bark, &c. which may have been used.

Upon the principle that substances dissolved in water in­crease its density, an instrument is used which is a variety of gravimeter—a floating bulb with a stem, graduated into certain fractional parts of the bulk of fluid displaced by it. This is generally called a barkometer ; and although it only indicates and measures differences of gravity, and conse­quently does not *necessarily* indicate whether it is tan, or gum, or sugar, in solution, yet in tanning solutions it affords a tolerable approximation to the relative strengths of so­lutions from the same substances. Each degree upon the stem is equal to 1/1000th part of the weight of water. Thus, 1° shows the specific gravity of the fluid to be 1∙001, and 60° are equal to specific gravity 1∙060, water being 1∙000. But this instrument is but of little use in oozes which have been long upon hides, as tannin is converted by long ex­posure into gallic acid, acetic acid, and carbonic acid gas : these act upon the soluble or interstitial gelatine, and by dissolving it in the poor ooze, give the fluid an apparent and not a real value by the instrument. Thus, if a spent liquor of 5° or 6° by the instrument be tasted, or tested, it will be found to have no astringent taste ; it will give no precipitate to gelatine while at the bottom, and in suspension it will contain gelatine, gallate of lime, and acetate of lime. Again, temperature alters the apparent strength ; and if an ooze indicating 30° be heated gradually, it will be found to appear weaker as the temperature rises, until at 190° Fah­renheit it will settle at 0, or no strength at all.@@®

@@@1 Some tanners, instead of laying their hides flat in the ooze, suspend them vertically. They are penetrated more quickly, but require fre­quent moving to prevent the fold from being an objection to their future sale; and a pit will not hold so many suspended as it will of laid bides. Skins, particularly light ones, are sometimes tanned by sewing them up as bags, filling them with fluid, and then throwing them into pits ; but although they thus tan quickly, they require a great deal of room.

@@@a When tannin in solution is exposed to the air for a short time, the following changes take place: every two atoms of tannin absorb six atoms of oxygen from the air, and are thus converted into three atoms of gallic acid, three atoms of acetic acid, and three atoms of carbonic acid gas. The gas flies off in part ; the other two acids remain, and give the acid taste and properties to the tanners’ poor liquors ;

Two atoms of tannin C36 H18 O24

Take from air. O6

C36 H18 O30