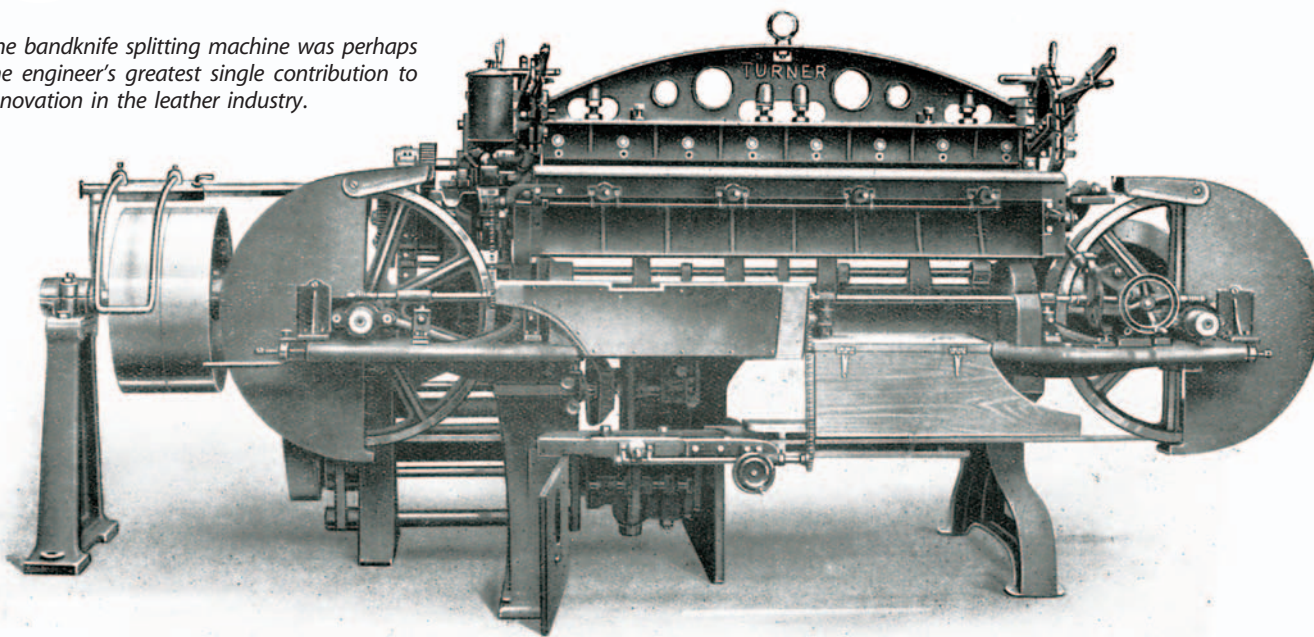




The Machine Minder

The bandknife splitting machine was perhaps the engineer's greatest single contribution to innovation in the leather industry.



Innovation in leather manufacture—the engineer's contribution

It sometimes seems to the tannery engineer that his principal contribution to leather manufacture is to take the blame when things go horribly wrong. Tanning is principally the business of chemists; engineers simply keep the wheels turning while the tanners produce silk-like purses from sow's ears, or something very similar. Just occasionally, however, the engineer can contribute an idea that radically changes the way leather is produced, or opens up a whole new field of possibility.

Tanning is often called the world's second-oldest profession, and the origins of the industry are almost lost in the mists of time. For the first few thousand years it was simply a matter of primitive organic chemistry plus muscle power, and the only technology involved was the edged hand tools used for flaying, fleshing, unhairing and the like. One is tempted to wonder if the hapless flint-knappers were castigated at Neolithic tannery production meetings for failing to produce edges that were sharp enough. Although the millwrights of mediaeval times produced some remarkable mechanisms with very limited materials, engineering as a profession only really began with the Industrial Revolution some two centuries ago. With the metalworking and textile industries leading the way, manufacture became centralised, and water and steam power gradually replaced muscle power. The leather industry lagged behind seriously, as always, and a whole generation passed before the Industrial Revolution started to penetrate the bastions of tanning. The birth of all tannery machinery probably came with the first use of a rotating bladed cylinder to replace the manual drawing of a blade across a hide. We do not know who first had the idea—perhaps it was a mechanic who strayed into tanneries from another more mechanised industry, perhaps it was a tanner with a particular aptitude for things mechanical. We do not know if it was driven by water, by steam or by muscle power, but we do know that it sired the family of machines that exists to this day for fleshing, setting out, shaving, and the like.

There is absolutely no doubt that engineers gave the tanning

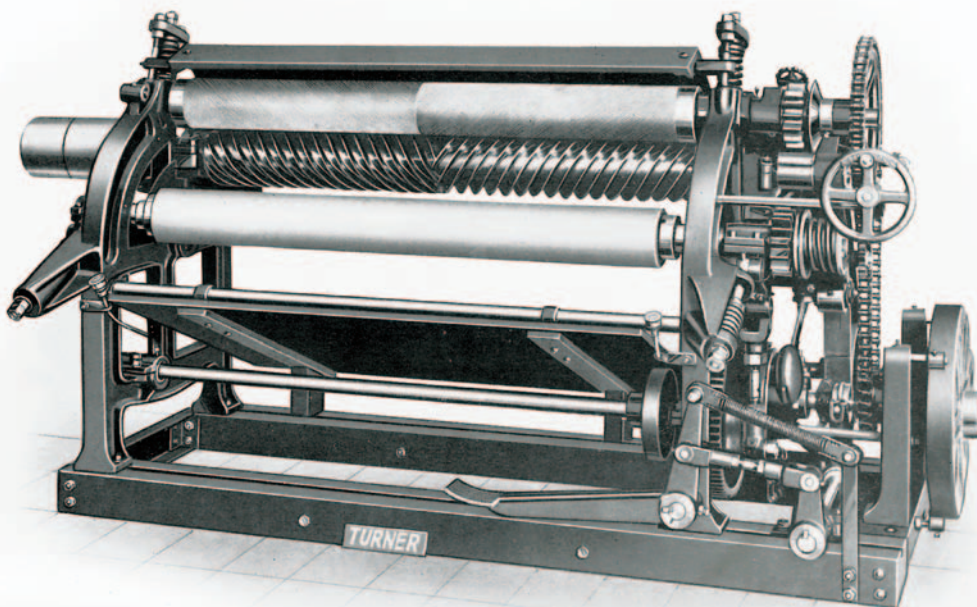
industry the basis for mechanisation through the central large steam engine driving all manner of machines through line shafting. By the middle of the nineteenth century this system was common throughout most sectors of industry, and even tanneries were belatedly adopting it, making leather production a true industry rather than simply a craft manufacture. Steam power brought engineers and mechanics into the tanning industry, and they began to address the particular requirements of machinery for leather manufacture. The splitting of heavy leather needed a specifically designed piece of machinery, and the bandknife splitter has undoubtedly been one of the engineer's greatest contributions to leather manufacture. The basic bandknife splitter first appeared around 1860, and the basic elements remain the same even in the computer-controlled units produced today. The bandknife splitter effectively moved tannery engineering up several grades—it was a precision machine, and could not simply be set up or maintained by semi-skilled



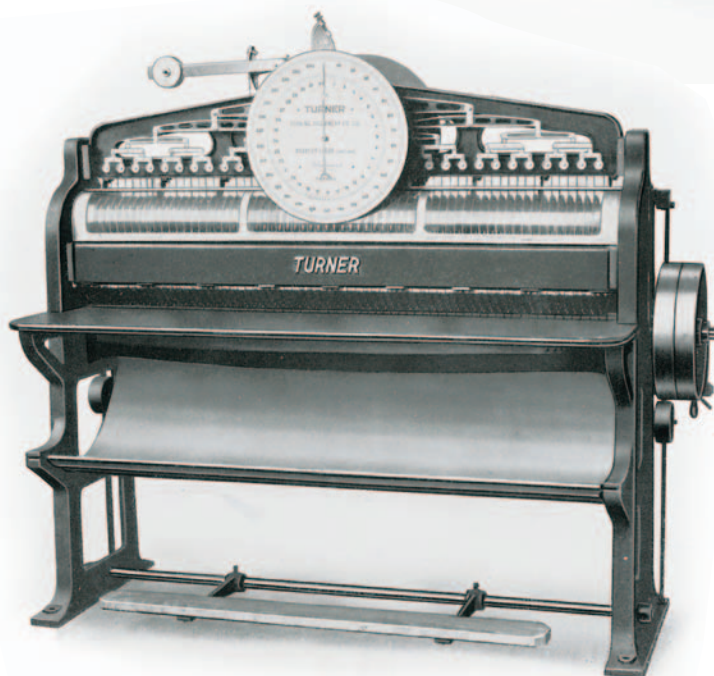
Manual fleshing on beams (Netherlands National Library)



graduates of the blacksmith's forge. A higher standard of mechanics working in tanneries accelerated progress in mechanising manual operations, no doubt with the enthusiastic support of the tanners, and the appearance of specialist tannery machinery manufacturers in the second half of the nineteenth century gave scope for true research and development. This period gave rise to several machine developments that must have been the result of careful study and design by skilled engineers, rather than flashes of inspiration from tanners. The reciprocating Slocomb-type staking machine is one example, as is the reciprocating



The multi-roller spiral-bladed machine



The 'pin-wheel' mechanical measuring machine was introduced in 1912

glazing jack, and the 'half-cycle' mechanism used for closing and opening bladed cylinder machines.

Many of these developments came from the USA, which then led the world in mechanical process automation, and the Turner Tanning Machinery Company began to grow into the international giant it became in the first half of the twentieth century. Perhaps its greatest innovation was the mechanical 'pin-wheel' measuring machine, introduced in 1912, which did away with measuring leather by template or manual 'areameters', and gave precise, uniform standards of area measurement to the industry. Any engineer encountering this fiendishly complex mechanical calculating machine for the first time cannot but admire the skill and ingenuity of its original designers. The design remained it was unaltered and in front-line service for over half a century, until superseded by photo-electric systems.

Another engineering innovation from the USA in the early twentieth century was the hydraulic heated platen press, and the idea was developed and refined by European machinery manufacturers such as Krause. The platen press opened up whole new avenues of possibility in leather finishing through embossing patterns into the grain, or smoothing out imperfections with a mirror finish platen. Although the roller press has largely taken over for volume production, platen presses are still made to this day, and offer great flexibility for low- to medium- scale production. At around the same time that the hydraulic platen press was being introduced, the reciprocating roller press (commonly called the 'Drees' press, after its principal manufacturer) came into use in the industry. This design can give even higher point pressure than the hydraulic press, and is particularly suited to heavy leathers; though no longer manufactured, many machines of this type are still hard at work around the world. ➤

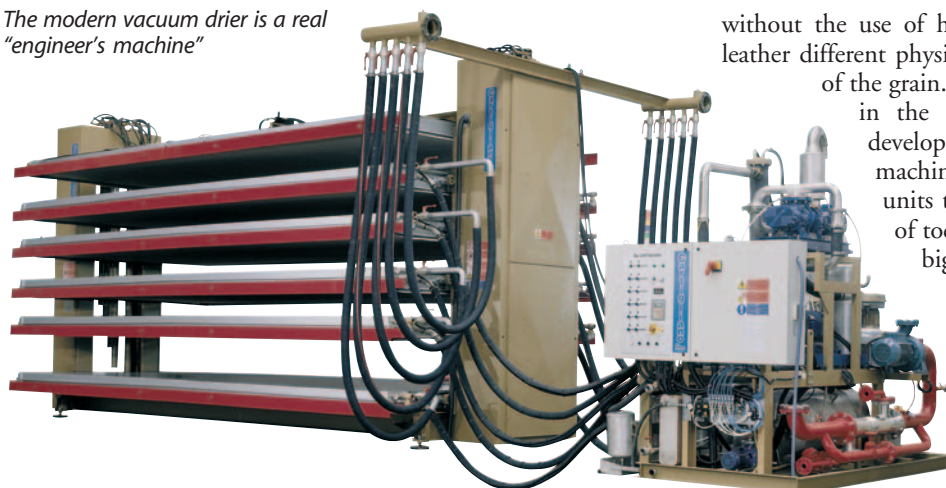


The basics of the heated-platen hydraulic platen press have remained unchanged for a century



INNOVATION IN LEATHER MANUFACTURE—THE ENGINEER'S CONTRIBUTION

The modern vacuum drier is a real "engineer's machine"



without the use of high temperatures, and actually gave the leather different physical characteristics, including presentation of the grain. Although the principle was first patented in the USA, the practical vacuum drier was developed in Italy, beginning with single table machines and moving on through twin-table units to the vertically stacked, multi-table units of today. These are real 'engineer's machines'—big and bafflingly complex to the layman, and requiring a good theoretical understanding of their operating principles in order to get the optimum performance from them.

The introduction of rollercoating to the leather industry may well be regarded as an engineering innovation, since it was promoted and

developed by engineers and designers from the tannery machinery manufacturing sector. It was, however, more of a technology transfer than a true innovation, since the principle had been in use for decades in the wood and textile industries for applying patterns and finish coatings. A great deal of ingenuity and perseverance was required to make the process work successfully on leather, and has been almost the life's work of some tannery machinery designers. At one time it was thought that rollercoaters might supersede spray finishing altogether for high volume production, because of their economy in chemical usage, but it now seems that in practice a combination of rollercoating and spraying gives the best results.

Two of the most significant contributions of the electrical engineer to leather production have been the electronic economiser for controlling spray patterns to minimise wastage, and the photo-electric area measuring machine. Although the latter simply replaces the mechanical pin-wheel measuring unit, it is able to work much faster and with unskilled labour. It was probably the first electronic computer application to find its way into the leather industry—it is worth noting that electronics established a foothold in the tannery at the clean end, and has gradually worked its way back into the messy parts as reliability and ruggedness have improved. The application of PLC control to all types of tannery machinery has been a notable development of recent years, but in very few instances could it be said to have substantially changed the way leather is produced.

Will engineers, mechanical and electrical, be able to make further major contributions to the production of leather? It is possible, but unlikely. Manufacture of tannery machinery has today become highly fragmented between many small, specialist companies. Very few of these have the resources or budget to support real, 'blue sky' research and development. The leather research associations are largely staffed by chemists and process specialists. Tanneries themselves have pared their engineering staff to the bone, and operate with contract servicing of their machinery wherever possible. Really significant innovation probably requires joint venture co-operation between machinery manufacturers, research associations and tanners, and, sadly, very few ideas are successfully developed by committee. There may still be some individuals out there, burning the midnight oil to design and develop the machine that will change the industry and make their fortune. We may, however, be in for a long wait....

TMM



Rollercoating machinery has radically changed leather finishing practice



Photo-electric measurement of area was the first real application of computer technology in the tannery

The introduction of hydraulic systems to replace mechanical mechanisms for closing and opening multi-roller machines began in the mid-1950s; while it made machines more reliable, controllable and accurate, this must be viewed as a refinement rather than a real innovation. A true engineering innovation from around the same era was the vacuum drier for dyed leather; vacuum drying gave the tanner a speedy method of drying