* * * * * * * * Comb-making is necessarily a prominent and extensive industry, in which a considerable variety of materials are employed, the most common being the horns and hoofs of cattle, tortoise-shell, ivory, box-wood, vulcanite or hardened Indian-rubber, and to a small extent German silver and other metals. Of these materials horn is by far the most extensively employed, and the working of that substance illustrates all the peculiarities of the craft. The industry is one still extensively prosecuted on a small scale, with all the disadvantages of manual labour and wasteful and tedious processes; but in several large factories very ingenious labour and material-saving machinery is brought into operation, as in the extensive and complete works of Messrs. Stewart & Co. of Aberdeen. In Messrs. Stewart's factory the raw material annually consumed averages 3,500,000 horns, about 1,000,000 hoofs, nearly 600 lb of tortoise-shell, and 20 tons of vulcanite, out of which more than 10,000,000 combs are manufactured. The British supply of horn is very limited, and altogether inadequate to the demand. The sources whence this raw material is drawn are chiefly South America and Australia, whence ox and cow horns are procured, and India, China, and Siam, which supply buffalo horns. When the horn is brought into the factory it is first assorted into sizes, preparatory to being cut up into pieces. From an ordinary horn two cross sections are taken for comb-making, called, first, the head or root cut, and, second, the screw or tip cut. The solid tips remaining are disposed of either for button-making or for being formed into knife and other handles. Other scraps and cuttings are of great value to makers of prussiate of potash, and for artificial manure. The sections to be used for combs are taken to the opening depart-
ment, where they are wetted in water and heated over an open fire, till the horny substance becomes quite soft. The head cut is slit longitudinally once, or if it is a large horn it may be slit into two. The screw cut is so termed on account of the peculiar spiral direction in which it is slit, the cut being so directed that the piece when opened out may form an oblong rectangular plate, with as little waste of horn as practicable. After slitting, the cuts are opened out between tongs, and inserted between screw plates, where they are pressed quite flat. Plates which are intended for staining, in imitation of tortoise-shell, are at this stage inserted in strong iron frames, between heated and oiled iron plates, in which they are submitted for some time to enormous pressure. After this pressure, the plates are found to have a translucent appearance, and a uniform greenish hue. The pressure, however, operates injuriously on the fibre or grain of the horn, rendering it liable to split. When, therefore, the horn is of good natural colour, it is preferred to finish it in that condition. The prepared plates of horn are laid aside to dry, in a room where a high temperature is maintained by steam-pipes. Subsequently they are squared and trimmed on circular saw benches, and assorted into sizes suitable for the various kinds of combs manufactured.

In the manufacture of ordinary dressing-combs two distinct processes of tooth-cutting are followed. The first method, which is applied to all fine combs, consists in cutting out the teeth by means of circular saws; and this is the only process applicable to the preparation of small-toothed combs, and all combs made of ivory and box-wood. Saw-cutting is, moreover, the only process formerly adopted, but instead of a circular saw, the comb-maker used a gauged hand-saw, called a stulda or steady. The saws now employed are of small diameter; and, according to the work they have to perform, they are fine-toothed and thin, some of them being constructed to cut from 70 to 80 teeth per lineal inch. The saws are mounted on a spindle which revolves with great rapidity, and the plate or plates of horn to be toothed are clamped up in a holder, which, by a cam motion, is alternately raised and depressed, bringing
the horn each time against the saw, which cuts out one tooth to its full depth. After each cut, an automatic arrangement moves the horn forward the breadth of a tooth, the gearing being so mounted that the teeth may be cut fine or coarse at pleasure. The second method of cutting the teeth is known as twinning, from the fact that a pair of combs are cut out of a single plate. The process of twinning consists in so cutting a plate of horn that the whole material is utilized, what is removed to form the teeth of one comb being exactly sufficient for the teeth of a corresponding opposite comb. When the cutting of twinned combs is complete, the plate presents the appearance of a pair of combs with their teeth exactly insculturating or dovetailing into each other. The twinning machine, by which this is accomplished, is a complex and beautiful piece of mechanism. The plates of horn to be twinned are softened by heat, and secured in a bed-plate which travels under a pair of cutting chisels, fast or slow, as the teeth are to be cut coarse or fine. The chisels, having cutting edges equal to the length of the teeth to be formed, descend alternately and cut through the plate, but as their cutting edges are at a small angle in relation to each other, the cuts are wedge-formed or tapering, and thus the pointed ends of one comb are taken out of the roots or head of another. With the aid of this apparatus a man and a boy can cut more than 2000 combs per day, while an old-fashioned comb-maker, working with his hand-saw, can only cut from two to three dozen combs daily, and that with almost double the material required in the twinning process.

After the combs are formed, either by circle saw or by twinning, they are next thinned or tapered to their outer edges, on grindstones. They then pass to the "grirling" department, where, by means of special forms of files or rasps, known as grails and topers, the individual teeth are rounded or bevelled, tapered, and smoothed. If the combs are to be finished in their natural colours, they are then smoothed with sand-paper, buffed on leather wheels, and polished on wheels built up of discs of soft calico. If, as is frequently the case, the combs are to be finished as imitation tortoise-shell, they are, in the translucent
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state before alluded to, treated with dilute nitric acid, which communicates a light yellow tinge like the ground colour of tortoise-shell. The deep semi-opaque orange spotting is next produced by dropping over the surface spots of a composition containing caustic soda, litharge, and dragon’s blood. After some time this composition is washed off, and the parts to which it was applied are found to be a little swollen up, and stained a deep orange tinge. The combs are then polished as above stated.

The elaborate pierced patterns of ornamental back combs are cut out by small ribbon saws; and the work is generally finished by hand-carving with proper tools. Plainer and less artistic work is done by embossing in heated dies, and ordinary pierced work is also produced by cutting dies. Formerly the wide-set teeth of back combs were frequently stamped out.

In order to economise tortoise-shell, and to obtain large and thick combs out of the comparatively small and thin plates in which that substance usually occurs, a process of cementing or soldering is resorted to. The joining of two plates of tortoise-shell is very perfectly accomplished by first carefully scraping and cleaning the surfaces to be united. They are then applied to each other, heated, and strongly pressed between pincers,—this being sufficient to cause a perfect amalgamation of the two surfaces. After cementation, tortoise-shell is treated in every respect as a piece of fine white or buffalo horn.