

noisy operations connected with the manufacture, viz. the 'planishing.' The saw is held in the left hand of the workman, rested on a small polished steel anvil, and hammered repeatedly on every part of the surface with a small hammer, whereby a clatter is produced from which a stranger gladly escapes. The object of this process is to make the saw true, even, and of equal elasticity in every part. The operation requires a great deal of dexterity; for the workman, by giving to the saw a kind of vibratory motion as he goes on, tests the elasticity and tension of the steel, and acquires by habit the tact of knowing where to strengthen the weaker parts by increasing the number of blows.

The saw is then carried to the 'wheel,' or grindstone, where both surfaces are ground all over, to reduce them to an even and regular state: this process having relation to the outer surface of the saw, while the planishing relates more to the internal texture. The grindstones employed for saws are of large size, sometimes as much as six or seven feet in diameter. The saw is too thin and flexible to be held against the grindstone as a knife would be; it is therefore fixed lightly to a board, and the board so held by the grinder (as sketched in our frontispiece) as to bring the saw in contact with the edge of the stone, shifting to and fro, until every part of both surfaces has been ground down level and true. As saws of the larger sizes could not be conveniently held in this way, they are suspended at both ends by cords from the ceiling, and swung backwards and forwards to bring them to the proper positions. The peculiarities attending this process are very exactly portrayed by Mr. Holland (in his *Treatise on the Iron and Steel Manufacture*), in the following words:—"It is not easy to conceive the idea of muscular exertion, imminent danger, and peculiarity of attitude presented to the eye; and the mind of an individual, who, unaccustomed to such a spectacle, looks at a saw-grinder when at work, standing on tiptoes over a great grindstone revolving with a fearful rapidity; his arms outstretched towards the extremities of the board under which lies the saw, and pressing against it with his knees to keep it in the closest contact with the surface of the stone; his person and dress appearing at the same time as if they had been dipped in an ochre-bed—present a picture of no common interest."

This grinding, though it gives one kind of regularity and equability to the saw, deranges it in respect to another; for the steel requires another planishing, or hammering on an anvil, to restore to it the flatness and straightness which the grinding had disturbed. After this second hammering, it is passed over a small coke fire till a particular and carefully tested degree of 'temper,' or elasticity, is given to it. Another grinding, but much slighter than the former, takes out the marks of the hammer, and gives a uniformity of appearance.

There next ensues a process so slight, so simple, and so soon ended, that it would seem hardly necessary to give it a separate place in the description; but it at the same time so remarkably illustrates the tact acquired by long practice, that a stranger is likely to be more struck with this than with any other part of the operations. If we look at the teeth of a saw, we shall see that half are bent in one direction, and half in the other; every alternate one being bent differently. This is done by the blows of a hammer, one blow to each tooth. The saw is rested flat on a steel anvil, and held by the left hand of the workman, who has a very small hammer in his other hand. With this hammer he strikes the sides of the teeth, one at a time; the weight of the hammer, the shape of the hammer-head, and the force of the blow, being just such as will enable one blow to give the required bending to the tooth. But the point worthy of note is the rapid and

unerring manner in which the workman proceeds along the saw, *missing* every alternate tooth, striking one blow on each of the others, and yet advancing from one to another almost as fast as the eye can follow him. He then turns the saw over, and bends the other half of the teeth in a similar manner, but in an opposite direction. There is a kind of bevel or slope in the small anvil, to effect a bending in the teeth of the saw.

These are the main features, such as we witnessed at the Saw-manufactory of Messrs. Hoole and Unsworth. Several minor details we may pass over, and the making of the handles we shall slightly notice in a future page.

#### *Table-Knives.*

A table-knife is perhaps the most important of the different articles of cutlery—not from its quality, for a razor is more highly finished; not from its intricacy, for a clasp-knife has more detail about it—but from the large extent to which the use has risen. Every house in England, except the very humblest, has as many table-knives in it as there are inmates; and most houses have a great many more. When we consider, too, that table-knives, as well as other articles, have the art of wearing away, and that the industry and the brickdust of the housemaid greatly hasten this process; and when we look abroad to notice the avidity which all rude nations exhibit to gain possession of an English knife—we shall be prepared to regard this as a very extensive branch of Sheffield manufacture.

There is in most of the operations on steel goods a series of processes pretty constant in their general character. The forging, the hardening, the tempering, the grinding, the sharpening, the polishing—all form steps in most of the series, and bearing a certain resemblance in their general character. A table-knife, for instance, is forged out of a piece of steel of higher or lower quality according to the price at which it is to be sold. The very commonest are probably not steel at all, being simply bar iron; the next quality may be common steel, the next shear-steel, and the highest of all cast-steel. But whatever be the material, a length of bar is cut off, sufficient for one blade, and forged into shape. All the Sheffield forges are pretty much alike. They consist of a forge-fire kindled by bellows; and have a large block of stone or wood, serving as a bench, and provided with small steel anvils, stithies, bosses, hammers, and other instruments necessary to the operation. The piece of steel is heated in the fire, placed on an anvil and hammered into form; being turned over and about in every direction, and the workman regulating his blows according to the form which he wishes to produce, reducing the thickness from one end to the other, and from one edge to the other. But this relates to the blade only; the 'tang,' or part which goes into the handle, is a separate part. To make this tang, the rudely formed blade is welded to a rod of iron, about half an inch square; and a sufficient length of this iron is cut off to form the tang, and also the 'shoulder,' or the projecting part between the tang and the blade. The end of the iron is heated and forged so as to be reduced in size sufficient to form the tang; and the shoulder is next brought into shape by hammering it in a kind of die or stamp called a 'swage.' The tang and the bolster being made, the whole is heated a second time, and the proper form and dimensions given to it. The blade is then heated red-hot, and plunged perpendicularly into cold water, by which a sudden hardening is effected; and a gradual heating afterwards to a certain point gives the 'temper' or degree of elasticity best fitted for the purpose to which table-knives are to be applied.