

leather, are previously rubbed over with an iron liquor, by means of a stiff brush, which, uniting with the gallic acid of the sumach, instantly strikes a deep and uniform black. They are then rubbed by hand, with a ball of glass, cut into a polygonal surface, with much manual labour, which polishes them, and makes them very firm and compact. Lastly, the *graining*, or ribbed surface, by which this kind of leather is distinguished, is given by rubbing the leather, very strongly, with a ball of box-wood, round the centre of which, a number of small equi-distant parallel grooves are cut in, forming an equal number of narrow ridges, the friction of which gives the leather the desired inequality of surface.

[TO BE CONTINUED.]

*On an Improvement in hardening Steel Cutting-Instruments. By Mr. E. RHODES, Cutler, of Sheffield, England.\**

The next head of my subject, is, by far, the most important; though perhaps, the least attended to.—*The hardening and tempering of steel*, is a process extremely simple; it requires more of *care*, than skill; on which account, it is in general, performed by workmen very inadequately rewarded: yet, in the manufacturing of an edged instrument, much depends on the nice management of this very simple operation, which either imparts a value to, or renders nugatory, all the labour that precedes, and all that follows it.

Practically concerned, for upwards of forty years, in the hardening of steel; and having had the process to perform, repeatedly, upon the finest and most delicate cutlery (scissors) ever manufactured; having studied the subject with considerable attention; and having accurately observed and noted the result of facts, as they occurred; the writer presumes he may be permitted to speak, on this part of his subject, with confidence.

It is a generally prevailing opinion, amongst men accustomed to the management of this process, that if steel be overheated previous to immersion, an extra portion of heat is likewise required to reduce it, or what is termed *let it down*, to a proper degree of hardness; and that, without this, a good cutting edge cannot possibly be produced. This, to say the least of it, is a miserable and inefficient attempt to remedy one error, by the introduction of another. That this is an extremely injudicious opinion, and that it operates, perhaps, more than any other cause whatever, to produce a mass of inferior cutlery, must be obvious to every one, who thinks at all upon the subject. It may be laid down *as a position*, which is not in much danger of being controverted, that *the lowest possible heat, at which steel can be worked, and become hard, is indubitably the best; and that to impart to it any extra portion, is essentially to injure its most valuable properties.* If overheated, the pores of the steel become open and expanded, the firm-

\* From his Essay on the Manufacture, Choice, and Management of a Razor.

ness of its texture is destroyed, *and it is rendered incapable of sustaining a cutting edge!* It must not, however, be inferred, from these remarks, that any degree of *temper* whatever, will operate to restore to steel the properties of which it has been deprived, by being *overheated*. Workmen, however, acting under the influence of the preposterous opinion here deprecated, manifest great carelessness in the performance of this very critical operation of hardening; always imagining, that the evil effects of this carelessness may be remedied, by resorting to a practice most evidently erroneous.

The reader is desired to keep in mind *the position* just laid down, that *the lowest possible heat, at which steel can be worked and hardened, is indubitably the best*. To men at all acquainted with the nature of steel, no argument will be necessary to establish this important fact: those who are not, may be referred to the foregoing, and the subsequent observations.

It has often been matter of regret to the writer, that *the phraseology of books and common life*, when applied to subjects intimately connected with a particular manufacture, furnishes no terms by which meaning can be so accurately expressed, as by *the technicals of the workshop*: these are always at hand, and the mind continually recurs to what it dare not use; it finds a task imposed upon it—not unlike that of translating from one language into another, in which the sense suffers by diffusion, and yet cannot possibly be compressed. It is, however, hoped, notwithstanding this difficulty, that the subject, here treated of, may be rendered sufficiently intelligible.

Articles manufactured of steel, for the purposes of cutting, are, almost without an exception, hardened from the anvil; in other words, they are taken from the forger to the hardener, without undergoing any intermediate process: such is the accustomed routine; but the mischief it occasions has either escaped observation, or is disregarded. The act of forging steel produces a strong scale, or coating, which spreads over the whole of the blade, &c.; and, to make the evil still more formidable, this scale, or coating, is unequal in thickness, *varying in proportion to the degree of heat communicated to the steel, in forging it*; it is, partially, nearly impenetrable to the action of water, when immersed in it, for the purpose of hardening. Hence it is, that different degrees of hardness prevail, in most razors manufactured: this is, evidently, a great defect; and so long as it continues to exist, a great difference of temper must exist likewise. Razor-blades not unfrequently exhibit the fact here stated, in a very striking manner: what are termed *clouds*, or parts of an unequal polish, derive their origin, chiefly, from this cause;\* and clearly and distinctly, (or, rather, *distinctly*, though not *clearly*) show how far this partial coating has extended, and where the action of the water has been yielded to, and where resisted. It certainly cannot be matter of astonishment, that so few improvements have been made in the hardening of steel, when the evil here complained of so universally prevails, as almost

\* These clouds are sometimes produced from the blade being heated too rapidly. Wherever they are observed, the razor is of unequal temper.

to warrant the supposition, that no attempt has ever been made to remove it. The remedy, however, is easy, and simple in the extreme; and so evidently efficient in its application, that it cannot but excite surprise, that, in the present highly improved state of our manufactures, such a communication should be made, as a discovery entirely new!

Instead, therefore, of the customary mode of hardening the blade from the anvil, let it be passed, immediately, from the hands of the forger, to the grinder: a slight application of the stone, will remove the whole of the scale, or coating; and the razor will then be properly prepared, to undergo the operation of hardening, with advantage. It will be easily ascertained, that steel, in this state, heats in the fire with greater regularity; and that, when immersed, the obstacles being removed, to the immediate action of the water on the body of the steel, the latter becomes equally hard, from one end to the other. To this may be added, that, as the lowest possible heat, at which steel can be worked, and become hard, is indubitably the best; so the mode here recommended, will be found to be the only one, by which the process of hardening can be effected with a less portion of heat than is, or can be, required in any other way. It has, likewise, another important advantage: it prevents the edge from being softened, by grinding on the first, or, as it is technically termed, the dry stone; a practice which generally prevails; and which frequently so injures the temper of the razor, as to render it an extremely unfit instrument for shaving. These observations are decisive; and will, in all probability, tend to bring into general use a practice, which cannot but be regarded as a very important improvement, in the manufacture of edged steel-instruments.

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*On the Choice and Management of a Razor. By the Same.*

It is, certainly, of some importance, that what a man is under the necessity of doing daily should be done well, and with as little inconvenience as possible. Shaving with a bad, or even an indifferent razor, may properly be regarded as one of the miseries of human life. It is an operation which men rather submit to than solicit: it is occasionally attended with pain, and as it cannot be avoided, it is, at any rate, desirable to lessen its unpleasantness. Hence every novelty, in the form and make of a razor, or even of a strop, have hitherto been caught at with some degree of avidity; the delusions have had their day, and, in all probability, answered the purposes for which they were created.

A few remarks on the weight and form of a razor will suffice, its primary excellence consisting in qualities of another description; namely, in its regularity and fitness of concavity, its hardness, and the durability of its edge. Weight and form are, notwithstanding, of some importance, and entitled to particular attention. The length of a razor, which generally varies from four to five inches, if manu-