

operation of *hardening*, which from various causes, a few of which I shall enumerate, is a process of much risk and difficulty ; for should any accident now occur, the labor of many months may be seriously injured, or even rendered quite useless.

The process of hardening soft steel is in itself very simple, though not very easily explained upon mechanical or chemical principles. We know by experience, that it is a property of this highly valuable substance, to become excessively hard if heated and suddenly cooled ; if, therefore, we heat a bar of soft malleable and ductile steel red hot, and then suddenly quench it in a large quantity of cold water, it not only becomes hard, but fragile and brittle. But as a die is a mass of steel of considerable dimensions, this hardening is an operation attended by many and peculiar difficulties, more especially as we have at the same time to attend to the careful perservation of the engraving. This is effected by covering the engraved face of the die with a *protecting paste*, composed of fixed oil of any kind, thickened with powdered charcoal : some persons add pipe-clay, others use a pulp of garlic, but pure lamp-black and linseed oil answer the purpose perfectly. This is thinly spread upon the work of the die, which, if requisite, may be further defended by an iron ring ; the die is then placed with its face downwards in a crucible, and completely surrounded by powdered charcoal. It is heated to a proper temperature, that is, about cherry red, and in that state is taken out with proper tongs, and plunged into a cistern of cold water, of such dimensions as not to become materially increased in temperature ; here it is rapidly moved about, until all noise cease, and then left in the water till quite cool. In this process it should pro-

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convenient box, in which the melted metal may be splashed, or *dabb'd*, upon it. The impression is often extremely clear and perfect, and exceeds in effect those which are taken in wax or plaster.