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On the economy of machinery and manufactures

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London, 1832

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CHAP. IX.

ECONOMY OF THE MATERIALS EMPLOYED.

(54.) THE precision with which all operations by machinery are executed, and the exact similarity of the articles thus made, produce a degree of economy in the consumption of the raw material which is in some cases of great importance. The earliest mode of cutting the trunks of a tree into planks, was by the use of the hatchet or the adze. It might, perhaps, be first split into three or four portions, and then each portion was reduced to a uniform surface by those instruments. With such means the quantity of plank produced would probably not equal the quantity of the raw material wasted by the process: and, if the planks were thin, would certainly fall far short of it. An improved tool, the saw, completely reverses the case: in converting a tree into thick planks, it causes a waste of a very small fractional part; and even in reducing it to planks, of only an inch in thickness, it does not waste more than an eighth part of the raw material. When the thickness of the plank is still further reduced as is the case in cutting wood for veneering, the quantity of material destroyed again begins to bear a considerable proportion to that which is used; and hence circular saws, having a very thin blade, have been employed for such purposes. In order to economize

still further the more valuable woods, Mr. Brunel contrived a machine which, by a system of blades, cut off the veneer in a continuous shaving, thus rendering the whole of the piece of timber available.

(55.) The rapid improvements which have taken place in the printing-press during the last twenty years, afford another instance of saving in the materials consumed, which is interesting from its connexion with literature, and valuable because admitted and well ascertained by measurement. In the old method of inking type, by large hemispherical balls stuffed and covered with leather, the printer, after taking a small portion of ink from the ink-block, was continually rolling them in various directions against each other, in order that a thin layer of ink might be uniformly spread over their surface. This he again transferred to the type by a kind of rolling action. In such a process, even admitting considerable skill in the operator, it could not fail to happen that a large quantity of ink should get near the edges of the balls, which not being transferred to the type became hard and useless, and was taken off in the form of a thick black crust. Another inconvenience also arose,—the quantity of ink spread on the block not being regulated by measure, and the number and direction of the transits of the inking-balls over each other depending on the will of the operator, and being irregular, it was impossible to place on the type a uniform layer of ink, of exactly the quantity sufficient for the impression. The introduction of cylindrical rollers of an elastic substance, formed by the mixture of glue and treacle, superseded the inking-balls, and produced considerable saving in the consumption of

ink :—but the most perfect economy was only to be produced by mechanism. When printing-presses, moved by the power of steam, were introduced, the action of these rollers was found well adapted to the performance of the machine; and a reservoir of ink was formed, from which one roller regularly abstracted a small quantity at each impression. From three to five other rollers spread this portion uniformly over a slab, (by most ingenious contrivances varied in almost each kind of press,) and another travelling roller, having fed itself on the slab, passed and re-passed over the type just before it gave the impression to the paper.

The following is an account of the results of an accurate experiment upon the effect of the process just described, made at one of the largest printing establishments in the metropolis.*—Two hundred reams of paper were printed off, the old method of inking with balls being employed; two hundred reams of the same paper, and for the same book, were then printed off in the presses which inked their own type. *The consumption of ink by the machine was to that by the balls as four to nine, or rather less than one half.* In order to shew that this plan of inking puts the proper quantity of ink upon the type, we must prove, first,—that it is not too little: this would soon have been discovered from the complaints of the public and the booksellers; and, secondly,—that it is not too much. This latter point is satisfactorily established by a reference to the frequency of the change of what is called the *set-off sheet*, in the old method. A few hours

* This experiment was made at the establishment of Mr. Clowes, in Stamford Street.

after one side of a sheet of paper has been printed upon, the ink is sufficiently dry to allow it to receive the impression upon the other; and, as considerable pressure is made use of, the tympan on which the side first printed is laid, is guarded from soiling it by a sheet of paper called the *set-off sheet*. This paper receives in succession every sheet of the work to be printed, and acquires from them more or less of the ink, according to their dryness, or the quantity upon them. It was necessary in the former process, after about one hundred impressions, to change the *set-off sheet*, which in that time became too much soiled for further use. In the new method of printing by machinery, no *set-off sheet* is used, but a blanket is employed as its substitute; this does not require changing above once in five thousand impressions, and instances have occurred of its remaining sufficiently clean for twenty thousand. Here, then, is a proof that the quantity of superfluous ink put upon the paper in machine-printing is so small, that if multiplied by five thousand, and in some instances even by twenty thousand, it is only sufficient to render useless a single piece of clean cloth.*

* In the very best kind of printing, it is necessary, in the old method, to change the *set-off sheet* once in twelve times. In printing the same kind of work by machinery, the *blanket* is changed once in 2000.