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**A dictionary of arts, manufactures, and mines**

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Preface.

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## P R E F A C E .

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It is the business of operative industry to produce, transform, and distribute all such material objects as are suited to satisfy the wants of mankind. The primary production of these objects is assigned to the husbandman, the fisherman, and the miner; their transformation to the manufacturer and artisan; and their distribution to the engineer, shipwright, and sailor.\* The unworked or raw materials are derived,—1. from the organic processes of vegetables and animals, conducted either without or with the fostering care of man; 2. from the boundless stores of mineral and metallic wealth, arranged upon or within the surface of the earth by the benignant Parent of our being, in the fittest condition to exercise our physical and intellectual powers in turning them to the uses of life.

The task which I have undertaken in the present work, is to describe and explain the transformations of these primary materials, by mechanical and chemical agencies, into general objects of exchangeable value; leaving, on the one hand, to the mechanical engineer, that of investigating the motive powers of transformation and transport; and, on the other hand, to the handicraftsman, that of tracing their modifications into objects of special or local demand. Contemplated in this view, an art or manufacture may be defined to be that species of industry which effects a certain change in a substance, to suit it for the general market, by combining its parts in a new order and form, through mechanical or chemical means. Iron will serve the purpose of illustrating the nature of the distinctions here laid down, between mechanical engineering; arts and manufactures; and handicraft trades. The engineer perforates the ground with a shaft, or a drift, to the level of the ore, erects the pumps for drainage, the ventilating, and hoisting apparatus, along with the requisite steam or water power; he constructs the roads, the bridges, canals, railways, harbors, docks, cranes, &c., subservient to the transport of the ore and metal; he mounts the steam or water-power, and bellows for working the blast-furnaces, the forges, and the cupolas; his principal end and aim on all occasions being to overcome the forces of inertia, gravity, and cohesion. The ores extracted and sorted

\*For correct and copious information upon agricultural production, I have great pleasure in referring my readers to Mr. Loudon's elaborate *Encyclopedias of Agriculture, Gardening, and Plants*; and for mercantile production and distribution, to Mr. McCulloch's excellent *Dictionary of Commerce and Commercial Navigation*.

by the miner, and transported by the engineer to the smelting station, are there skilfully blended by the iron-master (manufacturer), who treats them in a furnace appropriately constructed, along with their due proportions of flux and fuel, whereby he reduces them to cast iron of certain quality, which he runs off at the right periods into rough pigs or regular moulds; he then transforms this crude metal, by mechanical and chemical agencies, into bar and plate iron of various sizes and shapes, fit for the general market; he finally converts the best of the bars into steel, by the cementation furnace, the forge, and the tilt-hammer; or the best of the plates into tin-plate. When farther worked by definite and nearly uniform processes into objects of very general demand in all civilized countries, these iron and steel bars still belong to the domain of manufactures; as, for example, when made into anchors, chain-cables, files, nails, needles, wire, &c.; but when the iron is fashioned, into ever varying and capricious forms, they belong either to the general business of the founder and cutler, or to the particular calling of some handicraft, as the locksmith, gratesmith, coachsmith, gunsmith, tinman, &c.

Such are the principles which have served to guide me in selecting articles for the present volume. By them, as a clew, I have endeavored to hold a steady course through the vast and otherwise perplexing labyrinth of arts, manufactures, and mines; avoiding alike engineering and mechanical arts, which cause no change in the texture or constitution of matter,—and handicraft operations, which are multiform, capricious, and hardly susceptible of scientific investigation. In fact, had such topics been introduced into the volume, it would have presented a miscellaneous farrago of incongruous articles, too numerous to allow of their being expounded in a manner either interesting or instructive to the manufacturer and the metallurgist. I readily acknowledge, however, that I have not been able to adhere always so rigorously as I could have wished to the above rule of selection; having been constrained by intelligent and influential friends to introduce a few articles which I would gladly have left to the mechanical engineer. Of these *Printing* is one, which, having had no provision made for it in my original plan, was too hastily compiled to admit of my describing, with suitable figures, the flat-printing automatic machine of Mr. Spottiswoode, wherewith the pages of this volume were worked off; a mechanism which I regard as the most elegant, precise, and productive, hitherto employed to execute the best style of letter press.

I have imbodyed in this work the results of my long experience as a Professor of Practical Science. Since the year 1805, when I entered at an early age upon the arduous task of conducting the schools of chemistry and manufactures in the Andersonian Institution, up to the present day, I have been assiduously engaged in the study and improvement of most of the chemical and many of the mechanical arts. Consulted professionally by proprietors of factories, workshops, and mines of various descriptions, both in this country and abroad, concerning derangements in their operations, or defects in their products, I have enjoyed peculiar opportunities of becoming familiar with their minutest details, and have frequently had the good fortune to rectify what was amiss, or to supply what was wanting. Of the stores of information thus acquired, I have availed myself on the present occasion; careful, meanwhile, to neglect no means of knowledge which my extensive intercourse with foreign nations affords.

I therefore humbly hope that this work will prove a valuable contribution to the literature of science, serving—

*In the first place*, to instruct the Manufacturer, Metallurgist, and Tradesman, in the principles of their respective processes, so as to render them in

reality the masters of their business, and to emancipate them from a state of bondage to such as are too commonly the slaves of blind prejudice and vicious routine.

*Secondly*, to afford to Merchants, Brokers, Drysalters, Druggists, and Officers of the Revenue, characteristic descriptions of the commodities which pass through their hands.

*Thirdly*, by exhibiting some of the finest developments of chemistry and physics, to lay open an excellent practical school to students of these kindred sciences.

*Fourthly*, to teach Capitalists, who may be desirous of placing their funds in some productive bank of industry, to select judiciously among plausible claimants.

*Fifthly*, to enable Gentlemen of the Law to become well acquainted with the nature of those patent schemes which are so apt to give rise to litigation.

*Sixthly*, to present to our Legislators such a clear exposition of our staple manufactures, as may dissuade them from enacting laws which obstruct industry, or cherish one branch of it to the injury of many others: and,

*Lastly*, to give the General Reader, intent chiefly on *intellectual cultivation*, a view of many of the noblest achievements of science, in effecting those grand transformations of matter to which Great Britain owes her paramount wealth, rank, and power among the kingdoms.

The latest statistics of every important object of manufacture is given from the best, and, usually, from official authority, at the end of each article.\*

The following summary of our manufactures is extracted from Mr. Macqueen's *General Statistics of the British Empire*, published in 1836. It shows the amount of capital embarked in the various departments of manufacturing industry, and of the returns of that capital:—

	Capital.	Produce.
	£	£
Cotton manufactures - - - - -	40,973,872	52,513,586
Woollen ditto - - - - -	36,000,000	44,250,000
Silk ditto - - - - -	8,000,000	10,000,000
Linen ditto - - - - -	12,000,000	15,421,186
Leather ditto - - - - -	13,000,000	16,000,000
Iron ditto, to making pig iron - - - - -	10,000,000	7,098,000
Iron, hardware, cutlery, &c. - - - - -	25,000,000	31,072,600
Copper and brass ditto - - - - -	3,600,000	4,673,186
China, glass, &c. - - - - -	8,600,000	10,892,794
Paper, furniture, books, &c. - - - - -	10,000,000	14,000,000
Spirits (British), ales, soap, &c. - - - - -	37,600,000	47,163,847
Sundries additional - - - - -	-	9,000,000
Totals - - - - -	201,773,872	262,085,199

In consequence of an arrangement with Mr. William Newton, patent agent, and proprietor of the *London Journal of Arts, Sciences, and Manufactures*, I have been permitted to enrich this Dictionary with many interesting descriptions and illustrative figures of modern patent inventions and improvements, which I could not otherwise have presented to my readers. Mr. Newton has lately enhanced the value of his Journal by annexing to it a *catalogue raisonnée*, entitled "An Analytical Index to the Subjects contained in the 23 Volumes," which constitute the first and second series. The

\* The statistics of agriculture, trade, and manufactures is ably and fully discussed in Mr. McCulloch's *Dictionary* already referred to.

subsequent 22 volumes, of his Conjoined Series, are of still superior interest; and the whole form a vast storehouse of Mechanical and Chemical Invention.

Although I am conscious of having used much diligence for many years in collecting information for this work, from every quarter within my reach, the utmost pains in preparing it for publication, and incessant vigilance during its passage through the press, yet I am fully aware that it must contain several errors and defects. These I have studied to rectify, in the text of this edition, and more completely in a compendious Supplement.

Since this book is not a Methodical Treatise, but a Dictionary, one extensive subject may be necessarily dispersed through many articles. Thus, for example, information upon the manufacture of *Colors* will be found under azure; black pigment; bone-black; bronze; brown dye; calico-printing; carmine; carthamus; chromium; cochineal; crayons; dyeing; enamels; gold; gilding; gamboge; gray dye; green dye; green paints; indigo; kermes; lac dye; lakes; madder; massicot; mercury; periodide of; Naples yellow; orange dye; orpiment; paints; grinding of; ochres; paper-hangings; pastes; pearl white; Persian berries; pottery pigments; Prussian blue; purple of Cassius; red lead; rouge; Scheele's green; Schweinfurth green; stained glass; terra di Sienna; ultramarine; umber; verditer; vermilion; vitrifiable colors, weld, white lead; woad; yellow, king's.

A casual consulter of the Dictionary, who did not advert to this distribution, might surmise it to be most deficient, where it is in reality most copious.

The elaborate and costly Encyclopedias, and Dictionaries of Arts, which have appeared from time to time in this country, and abroad, have, for the most part, treated of the mechanical manufactures more fully and correctly than of the chemical. The operations of the former are, in fact, tolerably obvious and accessible to the inspection of the curious; nor are they difficult to transfer into a book, with the aid of a draughtsman, even by a person but moderately versed in their principles. But those of the latter are not unfrequently involved in complicated manipulations, and depend, for their success, upon a delicate play of affinities, not to be understood without an operative familiarity with the processes themselves. Having enjoyed the best opportunities of studying the chemical arts upon the greatest scale in this kingdom and on the Continent, I may venture, without the imputation of arrogance, to claim for my work, in this respect, more precision and copiousness than its predecessors possess. I have gone as far in describing several curious processes, hitherto veiled in mystery, as I felt warranted, without breach of confidence, to go; regarding it as a sacred duty never to publish any secret whatever, without the consent of its proprietor. During my numerous tours through the factory-districts of Great Britain, France, &c., many suggestions, however, have been presented to my mind, which I am quite at liberty to communicate in private, or carry into execution, in other districts too remote to excite injurious competition against the original inventors. I am also possessed of many plans of constructing manufactories, of which the limits of this volume did not permit me to avail myself, but which I am ready to furnish, upon moderate terms, to proper applicants. I conclude by pointing attention to the very insecure tenure by which patents for chemical or chemico-mechanical inventions are held; of which there is hardly one on record which may not be readily evaded by a person skilled in the resources of practical chemistry, or which could stand the ordeal of a court of law, directed by an experienced chemist. The specifications of such patents stand in need of a thorough reform; being for the most part not only discreditable and delusive to the patentees, but calculated to involve them in one of the greatest of evils—a chancery suit.