

CHEMICAL AND PHARMACAL ARTS IN THE PALACE OF LIBERAL ARTS AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

In so large a division of industries as those assembled under the caption "Chemicals, Drugs, Dyes, and Medicines," it is difficult to obtain figures that have a direct comparative value. There are so many articles of manufacture that even in showing, extent, or volume, there is necessarily much duplication of total amounts, the finished product in one class or group becoming the raw material of another. For purposes of classification the Thirteenth Census includes thirty classes under the group denominated "chemicals and allied products."

In considering the statistical analysis, to be shown immediately, of this great group it will at once become apparent how intimately they are associated with the daily life of the people. The very existence of some of the classes, as established parts of our commercial system, is important knowledge to the masses. And by the same token, to gather together a characteristic representation thereof, as will be done in the Liberal Arts Palace of the Exposition, must confer a lasting benefit upon the people. Science, it may be said, applied to manufacture, takes no backward step. Even the abandonment of a compound, for the use of a newer and better one, marks a step in development. And here one people teaches another by universal displays of these pseudo-arts. An exposition, especially one emphasizing modernity in processes, becomes a world's laboratory. Inventive science, everywhere, is stimulated to the production of a like compound, and, thus stimulated, often produces a better one. And the light spreads, until the whole earth is illuminated by the idea, and its use becomes the common property of all men. In this the Liberal Arts' displays takes place second to none.

The sale of drugs throughout the world illustrates the principle of mutual benefit in trade, which may be stated by paraphrasing the socialistic propaganda, "from each people according to ability, to each people according to need." Drug-houses have their buyers in all parts of world. In laboratories of the nations, lies advancement in almost every public utility. The dissemination of this knowledge, by means of national exhibits, at an universal exposition, becomes a state problem. Just to know where to buy the anti-toxins, which have been discovered and developed for use in the free clinics of civic institutions, is of immediate and never-ending benefit to the people. Even the new work in social science, depends upon investigations in these departments of physical science.

We introduce here as comprehensive of this group of industries the following figures: In all there are 9427 establishments engaged in manufacture. These employ 237,988 wage earners (average number) and turn out products valued at \$1,111,915,753. Of these establishments the drug trade is especially interested in the following: Chemicals, 349 establishments, product \$117,688,887; drug grinding, 25 establishments, product \$6,006,999; oil, castor, 4 establishments, product \$904,825; oil, cottonseed, and cake, 817 establishments, product \$147,867,894; oil, essential, 68 establishments, product \$1,737,234; oil, linseed, 29 es-

tablishments, product \$36,738,694; oil, not elsewhere specified, 189 establishments, product \$30,865,122; patent medicines and compounds and druggists' preparations, 3,642 establishments, product \$141,941,602; petroleum, refining, 147 establishments, product \$256,997,659; soap, 421 establishments, product \$111,357,777; sulphuric, nitric, and mixed acids, 42 establishments, product \$9,884,057; turpentine and rosin, 1,585 establishments, product \$25,295,017; wood distillation, not including turpentine and rosin, 120 establishments, product \$9,736,998.

In the class "chemicals" are included "acids, except sulphuric, nitric, and mixed acids, and such as are made by establishments in the wood-distillation industry; sodas; potashes, alums, coal-tar products; cyanides, bleaching materials; chemical substances made by electrical processes; plastics; compressed or liquified gases; fine chemicals, and all chemicals not covered by other more specific classifications"; "wood distillation, etc." includes pyroligneous acid, wood alcohol, acetates, tar, and charcoal made by the destructive distillation of wood in closed vessels at a red heat"; tanning extracts and liquors, including chrome tanning solutions; and mordants, sizes, gums, and dextrins"; and continuing through the list, which we have not space to specify further.

In group 36, chemical and pharmacal arts, Liberal Arts Palace, there were originally twenty-four classes, but not all the products in the census classification are included therein, part of them appearing in the Palace of Manufactures, Agriculture, and Mines and Metallurgy. The revised classification in the Liberal Arts Palace, contains twenty-one classes, showing equipment, processes and products, as follows:

"Class 148. Laboratory apparatus and utensils; lamps, blowpipes, presses, drying ovens, filters, furnaces, ovens, etc., used in chemical laboratory work.

"Class 149. Apparatus and instruments for making industrial and commercial analyses.

"Class 150. Equipment and processes used in the chemical treatment of animal substances, with their products; super-phosphates, soaps, candles, glycerine.

"Class 151. Apparatus and processes for the production by electrolysis of hydrogen peroxide, chlorine, hypochlorites, chlorates, soda, bleaching materials, and various other chemicals. Also electro-thermal apparatus and processes for chemical manufacture not otherwise specified.

"Class 152. Equipment and processes used in the manufacture of vegetable essences.

"Class 154. By-products for pharmacal use, obtained from the treatment of mineral substances, such as petroleum and coal tar derivatives, etc.

"Class 155. Equipment and processes used in treating waste matter from factories (by chemical or electrical methods), with a view to permitting their return to water courses or to the atmosphere.

"Class 156. Equipment for charcoal-work and the production of its various derivatives; methylated spirits, acetone, acetic acid, tar, wood alcohol, pyroligneous acid. Products of charcoal burning.

"Class 157. Apparatus and processes for the compression and liquefaction of gas. Liquified gases.

"Class 158. Apparatus and processes for the manufacture of artificial textiles.

"Class 159. Appliances and processes used in the manufacture of pharmacal products. Raw materials of pharmacy; sera and other biological products, as

bacterins, vaccins, tuberculins, etc.; drugs of mineral, animal and vegetable origin; crude, powdered and compound; special appliances for collecting, cleaning, peeling, slicing, cutting and garbling crude drugs.

"Class 160. Disinfectants; standardization of disinfectants; manufacture of disinfectants; drug preservation; drug sterilization; ampouls, etc.

"Class 161. Acids, alkalies, salts and compounds of every kind. Chemical elements derived from their compounds and chemical compounds not otherwise classified.

"Class 162. Refined sulphur and derivatives from sulphur.

"Class 163. Equipment and processes used, and products obtained, in the manufacture of phosphorus and matches.

"Class 164. Drug adulteration; methods of adulteration; methods of detecting adulteration.

"Class 165. Various products of chemical industries; tanning materials, waxes, essential oils, glue and gelatine; perfumes, cosmetics, and extracts; various glazes, printing ink, blacking.

"Class 168. Alcohols modified for industrial purposes.

"Class 169. Equipment and appliances for producing calcium carbide and for the storage of acetylene gas.

"Class 170. Insecticides; fungicides; parasiticides and methods of manufacture and use.

A mere glance at this classification discloses the fact that the showing of all these products is especially designed to benefit the public good. Nowhere in the whole exposition will the "pure food" laws find greater exemplification. Nowhere will the interested individual be better able to relate the whole to his daily living. Municipal authorities will be able to study the methods of amelioration which constitute their abiding problem, by witnessing the direct application of manufacture to use and the relation which the product bears to the public health. Not only this, but the retail druggist will be able to inspect the equipment and processes used in the manufacture of many of the articles which find standard sale over his counters. All of these results insure to the manufacturer-exhibitor a profitable return for the expense and trouble of installing his exhibit. When the fact is added that visitors and dealers from all parts of the world will witness, study and analyze the display, and experts will relate same to foreign markets, the benefits from a commercial point of view are still more apparent.

The infinity of creation is revealed as much by the microscope as the telescope. Science is yet in its infancy. The constitution of matter is not yet fixed. The atom has been succeeded by the electron. Where the material ends and the spiritual begins is a subject of fascinating speculation and fraught (if discovery be possible) with mystic possibilities in the treatment of disease. The germ theory has revolutionized in the short period of twenty-five years the practice of medicine. The chemical engineer, he who studies, long and minutely, crystals and compounds; what, for want of a better name, may be called the affinities of molecules or the laws of attraction and repulsion in material substances, has become a public servant and benefactor. And it behooves the man whose business it is to dispense the result of these labors to the people to keep abreast of every advance. Toxins and anti-toxins are not only in the hands of physicians licensed by the state, but they are in the hands of the pharmacist who must also receive

the permission of the constituted authorities to carry on his business. And general public results are justifying these cautions thrown around the use of all these products, dangerous or salutary, as the case may be.

Indeed, the wonders of modern chemistry are never ending, and the "apothecary shop" of old, has been transformed into a public clinic, from which remedies and compounds are dispensed to the public, for a nominal cost, that have become indispensable, because so well-known and understood by the pharmacist as to become fixed in the public regard. So marvelous are many of the modern discoveries that the ancient alchemist, with his dreams, is no longer the derision of the scientist. The transmutation of metals, in the case of some rare ones recently discovered, has been actually accomplished. Radium is, perhaps, the world's greatest wonder of today. Not all is understood. Effects are produced through the scientific process, which defy analysis, while the result remains. And in the case of some of the well-known disinfectants, results justify a use, when science is unable to explain the transformation.

The public value of the exhibits in this section of the Palace of Liberal Arts, therefore, cannot be overestimated. Foreign governments should see to it that public laboratories make contributions to this highly important department of the coming universal exposition. And manufacturers, by exhibit of their latest products, may reach unlimited markets in remote lands that will justify the investment of largely augmented capital.

LOYALTY.

"First, then, by industry you must fulfil your vow to your country; but all industry and earnestness will be useless unless they are consecrated by your resolution to be, in all things, men of honour; not honour in the common sense only, but in the highest. Rest on the force of the two main words in the great verse, "*Integer vitae, scelerisque purus.*" You have vowed your life to England; give it to her wholly—a bright, stainless perfect life—a knightly life. Because you have to fight with machines, instead of lances, there may be a necessity for more ghastly danger, but there is none for less worthiness of character than in olden time. You may be true knights, though perhaps not *equites*; you may have to call yourselves 'cannonry' instead of 'chivalry,' but that is no reason you should not call yourselves "true men." So the first thing you have to see to, in becoming soldiers, is that you make yourselves wholly true. Courage is a mere matter of course among well-born youths; but neither truth or gentleness is a matter of course. You must bind them like shields about your neck; you must write them on the tables of your heart. Though it be not exacted of you, yet exact it of yourselves,—this vow of stainless truth."—*John Ruskin, at the Royal Military Academy, Woolwich.*

Education is a better safeguard to liberty than a standing army.—*Everett.*