

Solutions other than aqueous for which occasion requires preparation may include an infinite range encompassing every conceivable substance with respective admissible solvent from the mechanical suspension as mixture to the typical solution, yet each and all are dependent upon the influences of broad generalizations applying.

It is not the purpose as perhaps was intended by Mr. Osseward when he requested me to contribute a theme along lines of practical pharmacy to detail specific instances upon individual solutions for that in itself would of necessity be very limited owing to lack of experimental data, yet it would no doubt prove intensely practical and I trust the future will permit a presentation along such lines.

The foregoing, though somewhat concise in statement, will furnish themes for future elaboration and if sufficient interest is aroused, it will have served its purpose at least, for a subject which is infinite in magnitude, for in its application to observed phenomena all such is dependent upon solution.

THE COÖPERATION OF SCIENCE AND INDUSTRY.*

A. R. L. DOHME.

Individuals, firms, corporations, states and nations have begun to realize and appreciate that coöperation among themselves for the attainment of any end is essential if the best attainable results are to be achieved. Let us take as a concrete example for all the above the rather remote but timely and pertinent subject of price cutting and the European war, both of which are menacing and crying evils.

Price Cutting—A manufactures a standard article which sells at 50 cents retail according to A's business plan. It probably costs 20 cents to produce and with advertising and the profit to the jobber and retailer nets the manufacturer 10 cents profit. The retailer instead of coöperating with the manufacturer and making his 25 percent net profit on it cuts the price and makes 5 percent, using it to advertise his store as a place to buy cheaper than at other stores. If it only went so far there would not be lack of coöperation and the manufacturer would be satisfied. Instead, however, the retailer induces the customer to buy his own manufactured article upon which he makes a good profit, or the retailer is seduced by competing manufacturers to buy a bulk supply of the same article under another name, which is sold in place of the originally advertised and controlled article. Both of these methods show entire absence of coöperation between the retailer and manufacturer and result in lack of real success to the manufacturer and the retail trade as a whole.

The European war is the result of commercial rivalry or rather lack of coöperation. If nations had been satisfied to live and let live and permitted each other to work out to perfection unmolested those products of nature and industry espe-

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cially adapted to and characteristic of that nation, there would have been no European war. In this all nations are more or less at fault. Labor and capital must cooperate if they are to progress and get on peaceably together. As soon as capital gets more than its just share of the profit labor will rise in arms, and as soon as labor is misled by bad and badly intentioned leaders to exact more than its just share, capital will protest. As soon as cooperation on a mutually satisfactory basis is established and maintained strikes and labor problems will cease.

The reason why Germany has progressed so much faster than any other nation in most lines of industry and why "Made in Germany" caused a war of destruction unequalled in history is, because in Germany cooperation exists in everything—government, education, industry, art, science, and the home. I would like at this time to refer to only one phase of cooperation, viz., the cooperation between science and industry because to my mind it is most typical of methods and results and, because as chemists it concerns us especially. Germany's preëminence in scientific education and university training is universally acknowledged for any one who has attended her universities knows that every nation sends many of her favorite sons there to be educated. In those halls and laboratories you see the American, Frenchman, Swede, Norwegian, Russian, Englishman, Japanese, Chinaman, Italian, Spaniard, East Indian, Greek, Turk, etc. This education and this research into the hidden secrets of science would of themselves help little to advance Germany. She goes further, and when her professors, teachers and students select a subject to investigate they do not always take up an abstruse subject which is only of purely scientific interest. Most frequently they take up some of the troublesome problems which are today confronting the industries of Germany and thus, besides gaining the experience and training their minds and hands need, they at the same time solve one of the many knotty problems which the manufacturer has unsuccessfully encountered and failed to solve.

My experience is probably typical of all. My "arbeit," as such research work is called in Germany was selected from about fifty available problems sent by the manufacturers to the universities for solution. The professor took me into his private laboratory and there, exposed upon a series of tables were samples of what was wanted and what was available as raw materials or by-products to be used in the work. The professor considers that he is doing his country a service every time he can help solve a problem of some industry and, as a result, all the great universities are cooperating all the time with the industries. The result speaks for itself:—German prestige in almost all lines and an industrial and commercial boom during the past 40 years unprecedented in history. The result of a cooperation instead of a holding aloof. It is this same cooperation that is enabling that great nation to hold at bay and practically defeat the entire concert of great nations of Europe, and Asia and Australia and Canada. The principle of cooperation is applied in practice and in spirit from the lowest private in the ranks, charwoman, housewife and children in the home to the highest head of every institution, civil and military. It has been a slogan that "in union there is strength." To my mind a better and truer slogan, because it also embraces the former, is "in cooperation there is success."

Contrast this with the attitude of our universities in their relation to our indus-

tries. They stand at bay, each too dignified to lower themselves to approach the other. The university professor considers it beneath his dignity to soil his hands with commerce or industry and the manufacturer considers it beneath his dignity as a successful, practical man to ask help of a man or an institution which considers and recognizes only the theoretical and disdains the practical side of any problem. Neither of them consider for a moment their common country and its progress and development among the nations of the world. To my mind the one nation is inspired by patriotism in its professional men, the other is inspired by personal advancement at the expense of the country and every one else. While this arraignment may be a trifle severe—for there are exceptions to it—the fact remains that there is more truth than imagination or exaggeration in it. The thing for our universities to do for our industries is what the Rockefeller Institute is doing for medicine. To so study diseases that the net result is not a splendid article in a journal or a book to glorify the author and discoverer, but instead an ability and means of curing them, preventing them, or doing both which is best of all. Let the men who are being trained in our universities fit themselves, each for some chosen industry so that when he completes his course he will know his science or subject thoroughly and besides will know enough about its application to some industry, say the manufacture of glass, so as to be able to establish a research laboratory for some glass factory and work out for them improvement in manufacture, further adaptation of glass to industries and possible utilization of waste products for producing economies in manufacture. In this way all our industries will progress and our country will prosper and grow in wealth, importance and contentment at several times the rate it is now. Our institutions of learning, hospitals, etc., should do more than this. They should welcome an opportunity to let any manufacturer try out or test his products in their clinics, laboratories, shops, etc., instead of hanging out a banner "noli me tangere."

Let me in closing point out the instance of what a university man so trained can do for an industry. The man was my fellow student who did his final preparation for the degree of Doctor of Philosophy with me for two or three months. (Another instance of the same spirit of coöperation, this time in study.) This was in 1889. The institution was the Johns Hopkins University. He had paid a little attention to petroleum because he saw in it a great future. He entered the employ of the Standard Oil Company. He worked conscientiously and applied practically all the knowledge he had learned at his alma mater. The result is the unexcelled world-leading petroleum industry. He is now its Second Vice President and he can feel most proud, although I know him to be a most modest man, because he has accomplished something for each of his fellow citizens in producing cheaper and better kerosene, gasoline, oil, wax, etc., than they had before and because, above all, he has placed his country in his line on the top rung of the ladder, for the Standard Oil Company is known the world over and is perhaps the most successful and extensive corporation known in the world. This case cannot be claimed to be an instance of the coöperation of which I am writing because the university did not especially prepare him for his work, rather did it expect him to become a professor; but he worked out the result for himself,

because he was eminently practical. This result shows however what is possible when science and industry cooperate. Why not train men for every industry so that glass, leather, sugar, paper, steel, iron, copper, cellulose, cotton, wool, bricks, cement, laundrying, silk, fertilizers, chemicals, dyes, etc., etc., can progress and excel just as did the petroleum industry under the skillful scientific guidance of William Merriam Burton.

The cooperation of science and industry can achieve this, and in my opinion nothing else ever will achieve it. In fine, the next great advance and development that this country will witness will be in her industries when these become standardized as the result of the cooperation of the science of the university with the practice of the factory, said cooperation to begin in the university and *not* after leaving the university. May this great advance come about now when the world is paralyzed by the clash of arms and the decimation of human lives and needs the help of our country more than it ever will. Let me in conclusion suggest that the Chamber of Commerce of the United States of America, a most efficient product itself of cooperation, call a conference of the heads of all our universities and of all our great industries and at that conference proclaim the gospel of "cooperation spells success" and as well, forge the link which will weld into an indissoluble union science and industry.

INCREASE IN THE ACIDITY OF HYDROGEN PEROXIDE UPON STANDING.*

C. F. RAMSAY AND A. M. CLOVER.

Most brands of hydrogen peroxide which are found upon the market are labeled as conforming to the requirements of the U. S. P. In the manufacture of this product it is not a difficult matter to properly regulate the amount of free acid, which must be below 1/100 normal. In Bulletin No. 150 (1912) of the Bureau of Chemistry, by Kebler, Warren and Ruddiman the fact is brought out, that most commercial brands of peroxide are excessively acid. The samples examined by these investigators were purchased from wholesalers so that they might be obtained in as fresh condition as possible. The acidity and strength were determined upon opening and the stability was ascertained by subsequent titrations. Apparently only one determination was made of the acidity.

From observations which we have incidentally made during a period of several years, we have been lead to believe that the unusually high acidity frequently noted in peroxide which contained acetanilid, is due in most cases to an oxidation of the preservative; for we have frequently observed that samples containing this substance gradually increase in acidity on standing.

The fact is well known that hydrogen peroxide containing acetanilid often takes on a yellowish-green color, as well as a disagreeable odor, due to the oxidation of the preservative, and we have observed that this change is accompanied by a loss in the strength of the active substance. A very stable peroxide does not develop a color even on long standing, while this effect is soon noticeable in a product

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