Rivalry in Discovery of Synthetic Rubber

IS the world on the eve of another commercial revolution due to an accidental chemical discovery? Is synthetic rubber going to take its place upon equal terms of competition with the juice of the trees and plants which so long have supplied the rubber commerce?

Just at the present time English and German chemists are disputing over their claims to precedence in finding a way to create from certain raw materials a chemical counterpart of natural rubber. The world at large is not directly concerned in the determination of this question of priority, but it has a very deep interest in the commercial practicability of these discoveries.

Two years ago Dr. F. E. Matthews of England, then associated with other distinguished chemists, among them Prof. W. H. Perkin, Sir William Ramsay and Prof. Fernbach, was seeking to perfect a cheap process for the manufacture of synthetic rubber and by chance left some isoprene and metallic sodium in contact for a period of about two months, going off in the meanwhile for his summer outing. Upon his return Dr. Matthews was amazed to find that the isoprene had in the interval been converted into solid rubber. The long sought key to the riddle was thus uncovered by an accident.

Isoprene is an oily, volatile hydrocarbon. It was obtained by distillation from caoutchouc fifty years ago by Williams, and the analysis of isoprene showed that it was chemically identical with the oil of turpentine. The problem since that day has been twofold; first, to derive isoprene from abundant raw materials, and then to effect its conversion into rubber through the medium of plentiful and cheap reagents. In order to compete with nature's product it was necessary that artificial rubber should be made in large quantities and at a cost which would put it on a par at least with the expense of gathering nature's rubber and delivering it at the factories.

Fermentation is an action set up by various kinds of germs, and Prof. Fernbach found the germ that would convert certain plentiful starchy materials into fusel oil, and from this fusel oil he obtained cheap isoprene. It was this isoprene which Dr. Matthews learned by accident how to turn into rubber by means of sodium. Sir William Ramsay and his associates believe that rubber can be made in this way at a cost of about 24 cents a pound. From 25 to 28 cents a pound is what it costs now to collect rubber in the far east and amid the forests of the Amazon. The heaviest after expense is involved in transporting the raw material to manufacturing centers, and also in purifying this rubber so that it shall be fit to go into the finished products.

The rubber hunter mixes the juice or latex of many trees, and the raw stuff is seldom uniform and is frequently filled with foreign substances, and even pebbles, the latter hidden away in the gum to increase the weight. The cost of getting rid of these things is heavy, and this fact must be borne in mind in giving proper value to any process for the synthetic making of rubber. It is natural to suppose that a chemical production would be subject to perfect control and that the synthetic rubber factory would be located where it could reach easily its raw materials and its market for the finished output. Climatic and geographical conditions have prescribed the zones in which the rubber plant can be successfully grown, even though its cultivation be subject to scientific methods and are free from the haphazard ways of the rubber hunter.

In England the present discoveries are hailed by Sir William Ramsay and his fellows not so much as a promise of commercial advantage but as a professional achievement which puts the British chemist ahead of his rivals across the Channel. That the Germans have good reason to be satisfied with their own accomplishments in this very field is undoubtedly true. The Germans claim that they have now a method for making rubber synthetically which will soon be ready to compete with the output of the tropical forests.

Back in the '80's Tilden, an Englishman, gave long study to the problem of making synthetic rubber, but abandoned his work finally because he did not believe the attainment practicable. The individual was powerless to cope with so gigantic a problem and his resources were unequal to the task. Capital was necessary as well as the united efforts of many men. In fact in one factory alone in Germany there were 300 college bred chemists concentrating upon the technical researches involved in that single establishment. Many factories in the fatherland had joined in this international effort to find an artificial process by which rubber could be built up synthetically from raw materials readily available, but to the Elberfelder Farbenfabriken belongs the distinction of priority in the solution of the problem. Dr. Fritz Hofman, director in charge at Elberfeld, gives his own story of the pursuit of the elusive key.

"By mere chance my attention was called to this question of synthetic rubber through a lecture delivered in London about six years ago by Prof. Dunstan. As a pharmaceutic chemist in a dye factory my work did not take me in the direction of rubber, but the problem fascinated me.

"I found on reading up the subject that caoutchouc was based on isoprene, and I tried to prove it. To do that I had to have isoprene, and, what was more, I had to have synthetic isoprene and not the kind obtained by a dry distillation of rubber such as had hitherto generally been used. I had a task before me.

"To the organic chemist coal is an ideal mother substance, and I chose it as my basic material. In this we were justified, and in March of 1909 Carl Coutelle and I succeeded in obtaining the first large quantity of pure synthetic isoprene—several litres of it. This showed us that we had the right formulae, the scientific execution of which was no longer questionable. But with the making of isoprene our troubles were not ended; on the contrary, they were but beginning.

"We were confronted with the problem of converting this liquid into that tough, elastic, plastic colloid which was to be a successful substitute for rubber, in truth its very counterpart. Theoretically the task was easy, because, as Beilstein says, isoprene is converted into caoutchouc by treating it with muriatic acid. Of course, we tried that at once, but for our pains we got nothing but oily chlorides—not a trace of rubber. We were apparently defied.

"We tried all sorts of likely and imaginable physical and chemical mediums in connection with isoprene, but the wilful stuff refused to thicken. Finally I discovered the power to perform this miracle hidden away in heat. There was nothing new in heating isoprene, but the result we obtained thereby was new. Other authorities had tried heat, but all they got was either an oily or at best a resinous substance.

"Polymerism in chemistry is that property peculiar to some compounds by which they differ in their molecular weights and also in their chemical properties even when formed from the same elements and combined in the same proportions. In other words, the structural atoms are differently arranged, and the body or substance thus differs from another of the same chemical get up but with its tiny units otherwise distributed.

"We soon recognized that the polymerizing power of heat could be furthered by numerous chemical admixtures, but we soon found that there are many more substances that work in opposition to this end. In August of 1909 I obtained the first rubber polymerized by heat in the laboratory of the Elberfeld works. In September of that year I submitted a sample of this material to Dr. Gerlach. He was the first to confirm that our product actually contained caoutchouc. A month later Harries tested our synthetic material with his ozone method, and by this means was able to establish that our heat polymerized isoprene was veritable india rubber."

Dr. Hofmann frankly admits that should the extensive rubber plantations cultivated under English direction in the Malay Archipelago meet expectations synthetic rubber will not be so necessary in supplying at a more reasonable rate the present market. However, he says that the synthesist has so adjusted conditions that he can compete with his ware in price and quality with the natural product.

Thousands upon thousands of experiments have thus been brought to a crystallized knowledge which makes it possible and practicable to embark upon the manufacture of rubber synthetically from available cheap materials. The plantations in the far east have been developing over a period of fully thirty-five years, and in a sense they have the start of the artificial product in a quantitative estimate, but this advantage will not continue if the chemist manufacturer can make rubber synthetically as cheaply as Dr. Hofmann predicts.

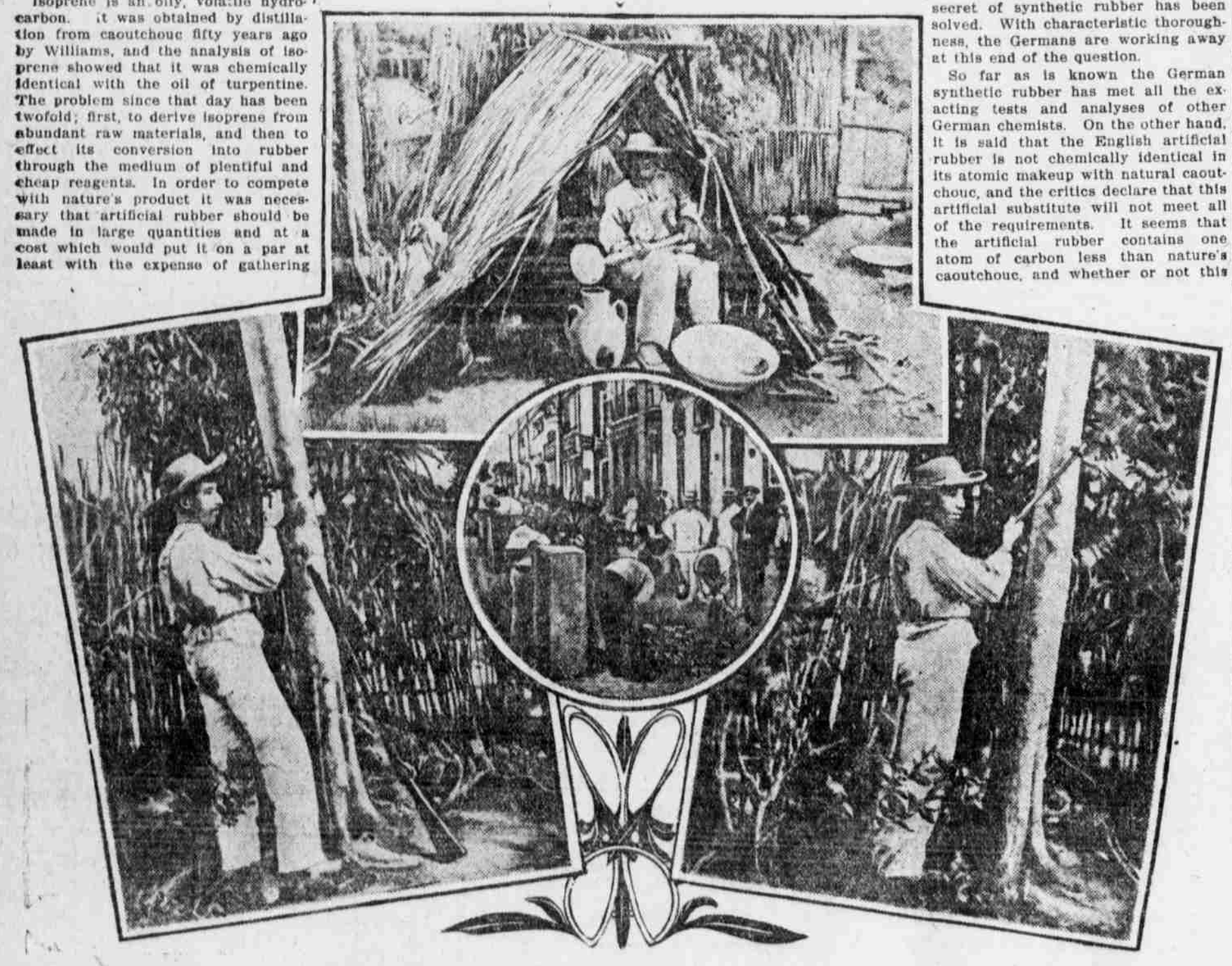
In 1910 and 1911 the world production of india rubber reached a total of about 80,000 tons and the world consumption of caoutchouc was in the neighborhood of 75,000 tons. Figuring the cost of this rubber at an average of $1 a pound the total value of the production reaches $160,000,000.

Synthetic rubber, it is believed, would make it possible to widen the field of application of rubber. Makeshifts and substitutes of one sort or another are now used in many directions, because natural rubber is too expensive. Therefore, the public is interested in the artificial product first because it will add stability to the price of the rubber from trees, and next it will make it possible to apply it in many ways now prohibited by price and the relatively limited output of plantations and the wild growth.

Whether the basic isoprene be made from a starchy substance after the English process or from a product of coal, as Dr. Hoffmann has chosen, there will be immense quantities of by-products which will be a part of the systems employed in making isoprene and in converting it into counterpart caoutchouc in either case. It would be financially prohibitive to neglect these by-products in concentrating upon the manufacture of artificial rubber.

Dr. Hoffmann says that if 25 per cent of artificial rubber could be produced from every pound of basic material, then a factory turning out half a million pounds a day would require 2,000,000 pounds of the mother substance, three-quarters of which would accumulate every twenty-four hours in the form of by-products. This gives an idea of what the chemist-manufacturer has before him, even though the secret of synthetic rubber has been solved. With characteristic thoroughness, the Germans are working away at this end of the question.

So far as is known the German synthetic rubber has met all the exacting tests and analyses of other German chemists. On the other hand, it is said that the English artificial rubber is not chemically identical in its atomic makeup with natural caoutchouc, and the critics declare that this artificial substitute will not meet all of the requirements. It seems that the artificial rubber contains one atom of carbon less than nature's caoutchouc, and whether or not this difference will prove vital either at once or later in the employment of the synthetic substance has yet to be established.



Summer School.

Particularly significant is the growth of summer schools in the Carolinas, where the movement started comparatively late. At the University of North Carolina there was an attendance of 450 this year, just double last year's enrollment. At the normal school at Greensboro, North Carolina, a session of eight weeks was held, the first in the history of the institution, and 200 enthusiastic teachers were in attendance. At the summer session of the Winthrop Normal College, Rock Hill, South Carolina, particular attention was paid to problems of industrial education and rural schools, and men of national prominence participated in the work.

Growth Attached to It.

"You've been sleeping in the telephone booth, I believe," said the manager of the summer hotel.

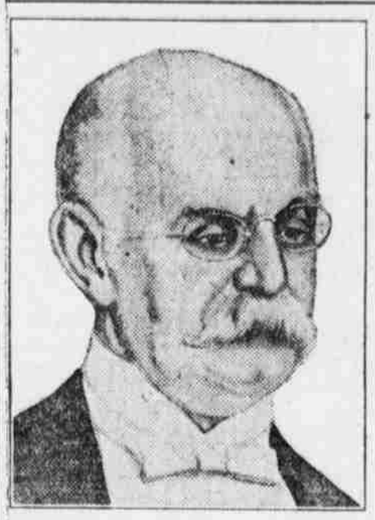
"Yes."

"I can give you a billiard table now, if you like."

"No; I'll stick to the booth. I rather like the room. It isn't large, but it's cosy."

WHO'S WHO AND WHY

CHAIRMAN OF THE EUGENICS CONFERENCE



Darwin's theory of evolution, the survival of the fittest and the influence of environment in the development of organic life, has provoked much controversy, and has sometimes been allowed to remain in the dim domain of speculation like the atomic theory of Epicurus or the Platonic system of ideas. It has at last been recognized as something practical in the social life of the human race. The most sober-minded of physicians, economists, and philanthropists have acknowledged that the improvement of the race, the promotion of its happiness, and the prevention of many moral errors depend very largely upon a recognition of such laws as that of heredity. The parents of the coming generation are to be looked to for the furthering of the race's happiness in the future. It is upon this basis that a new science, Eugenics, has been inaugurated and has claimed the attention of the world.

The First International Eugenics conference, recently held in London, was attended by men and women delegates from America, France, Germany, Norway, Italy, Spain, Greece, and Japan. It is interesting to note that the president of the society was the son of the very Charles Darwin who originated the theory of evolution on which its principles are based.

"It is essential to bear in mind," points our Major Darwin, "the truth that if the human race is to continue to progress, indeed, if it is not to lose some of the ground so painfully won in the long ages of struggle in the past, some other agency, checking the reproduction of the feeble in body and mind, must be made to take the place of natural selection, the action of which we are now in so many ways rightly endeavoring to prevent."

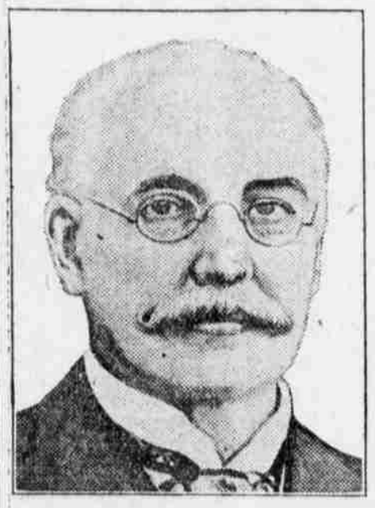
FETE OF THE "400" AT PUBLIC BEACH

Whirling about merry-go-rounds and thrusting at coveted brass ring prizes, bowling over "Aunt Sally" or shooting at bobbing balls in the rifle range, more than 300 members of the summer colony enjoyed several hours of amusement the other evening as guests of Mrs. Oliver H. P. Belmont at Newport's public beach. After 10 o'clock the public was excluded from Newport's miniature Coney Island. From that hour until they became tired, Mrs. Belmont's guests had full possession and enjoyed a night as informal as it was novel.

Mrs. Belmont's reasons for giving a free evening at Easton's beach were threefold, aside from her desire to pay social obligations. Those reasons were a protest against extravagant entertaining, an intention to turn over to a public institution money expended in a social diversion and an argument against the hiring of men waiters.

"In the first place I am in favor of the truly democratic idea in entertaining," said Mrs. Belmont. "I see no reason in the tremendous expenditure of money so common this summer in giving society an evening's diversion."

PROFESSOR MAXWELL'S NEW EXPERIMENT



New York will try an experiment this fall which, if successful, will completely overturn all methods hitherto applied in its schools and introduce a new era in education.

It is so sensational that, at first sight, it seems like the impossible dream of a mad inventor. Yet it has the thorough approval of men who are by no means identified with anything sensational and unpractical, among them Superintendent of Schools William H. Maxwell and Dr. Louis Blan of Columbia university, while the inventor of the scheme, Nikola Tesla, can point for corroboration of what he claims, to the extremely successful results already obtained by means of his invention in the schools of Stockholm, capital of Sweden.

Fifty mentally defective school children will be the first subjects of the experiment. They will enter and seat themselves in what will look, to all intents and purposes, like an ordinary schoolroom. But it will be far from that. Through the walls invisible electrical currents will run, by means of which, it is declared, the brains of the children will receive artificial stimulation to such an extent that they will be transformed from dunces into star pupils.

City Superintendent of Schools William H. Maxwell said, in confirming the report that the experiments are to be made:

"I am convinced that the high-frequency current has no deleterious effect; that, on the contrary, it is possitively beneficial, and that the experimental tests should be and in all probability will be carried ou in the Fall."

J. G. SCHURMAN NEW ENVOY TO GREECE

President Taft sent to the senate during the closing days of congress the nomination of Jacob Gould Schurman, president of Cornell university, to be minister to Greece. This nomination created some surprise, since there has been no announcement that George H. Moses, the present minister to Greece, was to leave that post.

It was stated that Mr. Moses voluntarily tendered his resignation for private business reasons some time ago, and that it has been accepted. He expects to leave this post within a short time. Intimations that Mr. Moses was being recalled were without confirmation at either the White House or state department or from members of the New Hampshire delegation.

Dr. Schurman, who has long been a close friend of President Taft, has arranged to take a year's leave from his duties as president of Cornell. In accordance with custom, Mr. Schurman, like all other ministers and ambassadors, will be expected to formally tender his resignation on March 4 next whether President Taft is re-elected or not. Dr. Schurman has been president of Cornell since 1892, and was born on Prince Edward Island fifty-eight years ago. He has a degree of A. B. and A. M. from the University of London, and is a LL. B. of Columbia, Yale, Edinburgh, Williams, Dartmouth, and Harvard.