

and many others, and also as a tribute to our ally with whom we are now standing shoulder to shoulder in the common cause of the world's struggle for liberty.

Continuing the program, Dr. E. C. Kendall of the Mayo Clinic, Rochester, Minnesota, gave a paper on "The Isolation and Identification of the Iodine-Containing Compound which Occurs in the Thyroid."

Special interest attached to the Tuesday afternoon General Session because of the direct bearing of the program on the many questions connected with the war situation. The first speaker was Dr. William H. Nichols, Chairman of the Committee on Chemicals of the Council of National Defense.

ADDRESS

By WILLIAM H. NICHOLS

Chairman Committee on Chemicals, Council of National Defense

It cannot be impressed too frequently or too strongly on the minds of the American people that the war on which we have entered is one which will require the faithful services and intelligent coöperation of every loyal citizen of the Republic, male and female, until the very end. No half-way measures will suffice. We are pitted against a power which has been preparing for many years and which did not strike until its preparations were complete. With that thoroughness for which the German people are deservedly noted, assisted and guided at every step by a highly intelligent Government, which, for many years, knew what it was aiming to accomplish, and intended to be ready for any eventuality, there was probably nothing which could be foreseen by human intelligence which was not provided for when the Belgian frontier was crossed. While this was true in all fields it was particularly true in the field of chemistry, which was proved to be in many ways the most important science made use of in the titanic struggle. Many of those present will remember the striking lecture of Dr. Bernthsen, delivered during the 8th International Congress of Applied Chemistry to an audience which packed the hall in its eagerness to learn the last, and to many the first, word on the fixation of atmospheric nitrogen. Probably no one among them realized the enormous influence which the process described was so soon to have on the fate of the world. We had been accustomed to consider that nitrogen fixation was practically dependent upon the electric arc and involved the consumption of enormous electrical energy. Dr. Bernthsen's exposition of what is known as the "Haber Process" was so clear and so skillful that even those who gave it only a passing thought could see the great potentialities of employing hydrogen instead of oxygen in the fixation process. Since the date of the delivery of that lecture in 1912, the production in Germany of nitric acid and ammonia in its several forms has become colossal and it may be safe to say that without the process alluded to the war, from the German side, would long ago have languished from scarcity of explosives, and the fields have become barren from lack of nitrogen. It is conceivably not too much to infer that the war was not launched until the way was clear for the production of nitrogen compounds after the vast accumulated stores of Chilean nitrate had become exhausted. This is one instance of many which might be cited to show the extreme preparedness of the German nation. From my own knowledge I can say that by comparison, the English and French were unprepared, both in men and equipment, and this was thoroughly understood by their enemies. As for Russian preparation, it was carefully looked after in Berlin.

While the beginning of the war found England and France not only unprepared but almost stunned by the suddenness of the shock, they lost no time in getting under way. At first many mistakes were made, and many steps taken which had to

be retraced, but fortunately no vital errors were committed. As a result of the gigantic program laid down, covering every phase of preparedness, these countries found themselves able to supply the vast armies which they organized, with every article, to the last detail, needed to make them effective. This offers one of the most extraordinary examples of intelligent coöperation which the world has ever seen. It is little short of a miracle.

It was well known in Germany that England and France were but comparatively small producers of fuming sulfuric acid or oleum. Not having a great dye industry, they felt little need for it outside of their explosive requirements and these were not large except in commercial explosives, used in mining and the like. But modern warfare cannot be conducted without oleum; and in a war like the present the quantities used of this article are enormous.

I have been told that the chemical works in England built since the beginning of the war, particularly for the production of war chemicals, such as oleum and nitric acid, covers an area of 27 square miles. Compared with anything existing anywhere previous to this time, such a chemical plant is unheard of. My informant, who spent some time inspecting it, referred more than once to the fact that a large proportion of the labor was done by young women who were reported to be extremely efficient. He saw them firing boilers and doing work of like heavy character and apparently thriving on it. These great chemical works are the backbone of the enormous output of munitions that has made the English artillery, as well as every other branch of the service, so efficient. I presume many of you are aware that the chemical engineer who superintended the construction of these great plants in England is an American.

Hardly less astonishing, and from many points of view more so, was the work done in France. When the history of the war shall have been written, one of its most brilliant and inspiring pages will be that recounting the exploits of the French chemists and the marvelous increase in the output of French munitions.

I have touched on these matters in order to indicate the great task confronting this country in organizing its forces. We have not yet a plant for the fixation of nitrogen, but I think I can truthfully say that this is not the fault of the chemists. We have, fortunately, a large output of oleum. I regret to say politics continues to be spelled with a capital P while patriotism is too frequently spelled without it. Up to the time when this country was forced to take part we may just as well admit that we as a people were living in a fool's paradise with little thought, except in the minds of a few, that we would be drawn into the whirlpool sooner or later. One of the great battle-cries of the last presidential campaign, which had much to do with the result, was "He kept us out of war." It seemed as if the height of the ambition of vast numbers of our people were to keep out of war no matter what it cost in moral fiber or self-respect. To many who hold the same views as I do, it was astonishing that in view of what was taking place on the other side of the ocean we did not in ordinary prudence prepare long ago for a shower in case the wind should change and come our way, which it was almost certain to do. The fact that we had not commenced preparing three years ago is, to my mind, the reason why we are in the war at all; but at this late date there is little to gain by discussing what might have been or what should have been. We have now definitely entered and we are committed to do our part until the end and this part we pledge ourselves to make worthy of our great Nation and its traditions. We are fighting for great principles under a leader who is able to state them so that all may understand who will.

Promptly after the declaration of war our authorities at Washington proceeded to take steps with commendable rapidity. They have been criticized a great deal because these steps have not been more rapid, but those who are acquainted with the

difficulties of the situation realize that this criticism is not merited. We are a peace-loving people and had been at peace many years. There are a good many things which the ordinary citizen does not know and cannot be told—not that he cannot be trusted, but the intelligence might carry too far. Ours is a Democratic Government and no one man or group of men has had such powers as will be found to be necessary before we can hope to effect an organization able to cope with the demands that will be made upon it. Our organization at present is, in my opinion, temporary. Of course, the President is and must be its head. Next to him is the Council of National Defense, composed of six members of the Cabinet. After this Council comes the Advisory Commission of the Council of National Defense and the War Industries Board, whose duties are not yet clearly defined. The Advisory Commission is divided up into several committees, among them one on raw materials. The Committee on Chemicals is one of the sub-divisions of this, and its functions are advisory. Why one of the most abstruse of all the sciences having to do with some of the most delicate and highly refined finished products should come under the head of Raw Materials is hard to see, but such is the case. We chemists are accustomed to being misunderstood.

I was honored with the chairmanship of this committee and have organized it along lines which previous experience led me to believe would be efficient. The work has been divided into the following heads: Acids, Fertilizers, Alkalies, Electro-Chemicals, Coal-Tar By-Products (including Ammonia), Pyrites, Miscellaneous Chemicals, Phosphate Rock.

I was able to secure the services of men well known to the industry as chairmen of these sub-divisions and they in turn were fortunate in obtaining many of the best men in the industry for their special committee members. In all, the Chemical Committee, with its sub-committees, includes some thirty-seven men. These chairmen meet twice a month in Washington and in the interval are at work endeavoring to solve the problems of production which are assigned to them. I think you understand all the work of the Committee on Chemicals has to do with the actual materials, not with research. This latter subject is in charge of the National Research Council, the chairman of whose Chemical Committee is a member *ex-officio* of the Committee on Chemicals, thus keeping both branches in close and constant touch. The Bureau of Mines is represented by its able director.

The committee is located in inadequate offices in the Interior Building, fortunately adjoining the office of the honored secretary of this Society, whose services are thus easily and quickly obtained at any time. Our duties are many, some merely routine, such as obtaining information for various departments, procuring satisfactory prices for articles needed, keeping in touch with the Railway Commission to see that goods move as freely as possible, and many others of a like character, which will occur to you. In addition to these there are many duties of a more serious character, requiring much active and intelligent work. Generally speaking, the manufacturers have responded admirably and there are many instances of sacrifices being made for which recognition is not expected and probably will not be received. It would be idle to state that there are no exceptions, but every effort is being made to produce satisfactory results without resort to higher authority. We feel confident that as the war progresses the ability of the committee will be found to be equal to the problems as they arise. If, however, it should be found that they are not, we understand perfectly that we will be expected to make room for those who are better qualified. The main point is that our Army and Navy must be supplied with everything that the chemist can give, while at the same time our industries shall be interfered with as little as necessary. It may happen, as time passes, that in spite of all precautions the industries may suffer to some extent, but you can depend upon it that this will not be the case

if it can be avoided by human foresight. There must come a time when this war shall end and we should be constantly preparing ourselves not only to provide its requirements while it lasts, but to meet conditions as we find them at its termination. Many theories have been advanced as to what will happen when peace once more blesses our staggering world, but I believe we should so plan our affairs that whether expansion or contraction results, we shall be able to meet either condition with a bold front.

One of our most serious difficulties arises from the unwillingness of the military authorities to recognize the wisdom of exempting chemists as a class from the draft. Almost from the beginning of our work we took up this question from various angles, realizing, as we do, the vital importance of keeping chemists at work in their profession not only at the present time but more particularly for the future. Our civil, mechanical, electrical, and other engineers can be made good use of at the front and not only contribute greatly to the success of our forces, but, by the valuable experience obtained in their profession, can improve themselves for future service at home. This is not true of chemists, with an exception here and there. Once in the Army and at the front, if he be only recently out of college, he is lost to chemistry forever. They are not slackers and are just as anxious as any other red-blooded young men to get into the fray, and therefore I have believed it wise not only to have them exempted from the draft, but declined in case they should enlist. Already serious trouble has come to many of our chemical plants and plants employing chemists, as a result of the draft, and unless wise provision be soon made we can foresee a condition which it will cost months to rectify. Why should we not take advantage of the experience of our English friends who have passed through this same situation and learned that there is a large class of men who can do more valuable work behind the lines than they can in the trenches?

The one great need of any colossal organization is the complete coördination of all its parts. No one can claim that the organization in Washington has yet reached this stage or even approximated it. Many things are done several times over and many others needed are not done at all. I presume this condition is unavoidable at this stage of our progress, but it must not be allowed to continue indefinitely. We have the utmost confidence that the President and his advisers can be relied upon to produce the required organization coördinated and articulated so perfectly that it will work with giant force and with little friction. This will come after politics have given place to patriotism, and this will happen, I believe, when the people of the country thoroughly appreciate the fact that we are at war. In any event, I am sure the country can rely upon the 10,000 chemists of this Society to do everything that lies in their power to see that the chemistry branch, possibly the most important of all, is not found lacking in either ability or patriotism.

Dr. Nichols was followed by Professor Marston T. Bogert, Chairman of the Chemistry Committee of the National Research Council, who gave an account of the organization of the research workers of the country and a general outline of the many problems coming within the purview of that committee. We hope to publish this address in full in our November issue.

In continuation of the Conference, Dr. Roger Adams, of the University of Illinois, explained the unique development in that institution of the manufacture, on a small commercial scale, of rare organic chemicals.

On the invitation of President Stieglitz, Lieutenant Engel, of the French Commission, addressed the Society as follows:

"I desire first to emphasize the mistake it is to take chemists from where they are most needed and to place them in the

trenches, as we did ourselves, and have lost them where they are most needed, in the laboratories and the industries. We made this great mistake at the beginning of the war. We took all chemists available and sent them into the regiments, mostly the infantry. Perhaps we lost 60 per cent of our mobilized chemists below the age of 40; for instance, the School of Chemical Engineering, Paris, has a casualty list of 35 per cent. At the Normal School, in the scientific department, there was a loss of about 52 per cent in the first ten months of the war. I cannot tell you emphatically enough that we must in all of our allied nations do our best to keep scientific men where they are most needed, not only for war problems, but for the future upbuilding of these nations. In general, the slowness to recognize scientific men by the military authorities was because they did not realize for what they were needed. For a long time they worked with the old methods of warfare and believed that all conditions were provided for, but when the method of attack changed, as Dr. Bogert has mentioned, when the gas attacks came, the military authorities saw that the time had come to adapt new materials to the new methods. That involved an enormous amount of work, not only in chemistry, but in physics and all branches of engineering.

"After three years of experience our scientific departments are well and satisfactorily organized. The organization is simple. The 'Front Laboratories,' mainly toxicological, detect poison in the water supply, for example, and provide chemicals to neutralize the effect if possible. These laboratories exist in large numbers, one with every brigade, or perhaps with every division, and are connected with a central army corps laboratory. In the front laboratory, in the field, there is often not even a tent, simply a box containing the needed supplies. The chemists work in the mud, on the ordinary ground, taking samples of the water, making chemical tests for nitrites, nitrates and chlorine. Thus they discover whether the water is pure or of slight doubt. If the latter is the case, the sample is sent to the army laboratory, where a bacteriological test is made. These army laboratories are usually located in the towns behind the lines, using in many cases school laboratories. Chemical advisers are connected with the general staff.

"At the rear there is an organization located in the schools where new compounds are studied, also unburst shells, samples of gases, parts of masks, in fact, any material which can be obtained. Other laboratories take care of factory supervision. Chemical manufacturers are producing gases and explosives.

"The manufacture of explosives is almost entirely under government monopoly. Previous to the war, hunting and war powders were made under government control. Only a few dynamites and safety powders were made under government control by supply contractors. The government is able thus to control entirely the explosive work.

"Speaking of general problems of research, I am interested to see what wonderful scientific organization there is here. You have more laboratories and facilities, more credit involved, your field of activity is tremendous. I am struck to see that in so short a period so many problems have been solved. It is an honor to be able to say that you have solved questions in a better way in three months than we took three years to do. You have been obliged to do over again much that we had already done. From now on we hope to work in such close connection with Dr. Bogert and others as to bring all data together and render work easier and avoid duplication. We hope to succeed in working very closely with you."

In conclusion, Dr. A. A. Noyes, of the Government Nitrate Supply Committee, spoke of the findings of that committee (published in detail in the September issue of *THIS JOURNAL*).

Immediately after the adjournment of the Conference, more than 400 members enjoyed the boat trip to

Pemberton where a delightful shore dinner was served, immediately followed by a smoker in one of the adjoining hotel buildings. Great enthusiasm was aroused by the singing of the Marseillaise, led by Dr. L. H. Baekeland. Toward the close of the smoker, Professor Talbot, acting as an informal toastmaster, introduced President Stieglitz, who responded for the visiting chemists in appreciation of the many courtesies extended. Professor Grignard was then introduced and spoke with much feeling, but in French. For the benefit of many of his hearers Lieutenant Engel, upon request, gave in English the substance of Professor Grignard's remarks, in which he concurred most heartily.

"Professor Grignard considered the organization and administration of the American Chemical Society the best in the world. Hitherto Germany had led in this regard, but he felt that the Germans had never possessed the spirit of democratic friendship which characterized the members of this Society. France is now preparing to imitate the American Chemical Society in its organization. The Chemical Society of France consisted formerly only of distinguished men in pure science. As the chemical industries developed, effort was made to form an industrial section, but this idea was rejected. A few months ago preliminary steps were taken under the stress of war for the organization of a French Society of Chemical Industry. However, in the light of what he has learned here as to the mutually helpful union of men of the universities and of the industries, he felt confident that in the future the two French organizations will be merged and that a truly national organization similar to the American Chemical Society will result. He hopes to see organized an American branch of this greater French Society so that joint work may be best promoted."

Dr. Baekeland followed, speaking in his happiest vein, to the very great delight of his hearers. The final speaker was Dr. A. D. Little, who spoke in lighter vein of some typical local chemical exploits, such as the extraction of gold from sea water, etc. Turning, however, to the more serious side, he pointed out that the payment of the great national debt due to this war should result most largely through the activities of the American chemists. Waste must be avoided: waste in city government, fire losses, manufacturing, railroading; waste of power, forest and labor.

Wednesday morning and afternoon were devoted to conferences and divisional meetings. A synopsis of the conference in the Division of Industrial Chemists and Chemical Engineers on "The Industrial Chemist in War Time" is printed in this issue.

On Wednesday evening, in Huntingdon Hall, Boston, before a large audience, President Stieglitz delivered his Presidential Address on the subject: "The Outlook for Chemistry in the United States." This address will be published in full in the *Journal of the American Chemical Society*.

Thursday was devoted to a continuation of the divisional meetings, including the Metallurgical Symposium in the Division of Industrial Chemists and Chemical Engineers. The Division of Water, Sewage and Sanitation made a trip to Ayer to inspect the United States Camp located there. Under the guidance of Mr. R. S. Weston they were given unusual facilities to see the cantonment, including the barracks and the excellent water and sewage disposal systems.