WAR-DEVELOPMENTS IN ENGINEERING *

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THIS subject might suggest discussions of large concrete groined arch covered reservoirs or concrete digestion tanks without a pound of steel; laminated wood arches to support roofs of huge hangars and drill halls; multiple pontoons with harness designed to fit them into beachhead docks or river bridges; sectional welded assembly line fabrication of cargo ships; or the condensation of vast units of power into a mass no greater than the shot heaved by competitors in tracks meets but capable of splitting the atoms of earth into their definitive parts over at least ten square miles of its surface. From providing necessities with use of available materials to producing machines that concentrated and released the greatest destructive power yet formulated by basic scientific research, the engineers have demonstrated their ability to apply science to essential needs of the greatest crisis in world history. But with such demonstrated ability the engineers have comparable responsibility to advise their representatives dealing with national and international problems on all matters involving technology. *Dawning recognition of the vastness of the responsibility of engineers in all fields of the profession is the most important war-development in engineering.*

In a brief address it will therefore be prudent to pass by the accomplishments of "the impossible", yes, and even of "the miraculous", which were the engineers' contributions to the defeat of the Axis Powers. It will be of immediate interest to outline some actions initiated by engineers to implement their determination to aid Government in solving all important technological problems essential to the establishment of a lasting peace.

Presidents and Secretaries representing five American engineering societies were guests of The Engineering Institute of Canada in Quebec in February 1944. At an informal meeting which included the Vice-Chairman of the War Production Board, the discussion admitted responsibility of engineers to work as effectively for the organization of peace as they were then working to win the war. This challenge to a profession, tired and harassed by continuing overtime hours of effort, alerted the officers of the various societies to seize every opportunity to contribute engineering "know how" to the solution of this history old world problem.

A committee composed of the President, Junior Past President, and Secretary of each of A.S.C.E., A.I.M.E., A.S.M.E., A.I.E.E. and A.I.C.E., known as the Joint Conference Committee, had been in existence for several

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years. This was a logical body in which to develop needed joint actions, although its powers were limited to recommendations from time to time to the governing bodies of the constituent societies. However, it had established a Joint Committee on Organization of the Engineering Profession. It recommended and established in 1944 a Joint Committee on Economic Status of the Engineer, and its individual members sought information in various departments and agencies of Government and organizations of private enterprise as to possible engineering aid in their deliberations.

Engineering thought and advice was clearly lacking in a plan developed by a Cabinet member for postwar control of Germany and reported by the press in September 1944. Therefore, the Presidents of the five societies participating in the Joint Conference Committee released at a press conference September 29, 1944, a plan for consideration and further study which gave proper weight to engineering knowledge of war and peace economics.

Conferences with various officials were held in Washington, including a meeting of Presidents and Junior Past Presidents of Joint Conference Committee with Acting Secretary of State, E. R. Stettinius, Jr., representatives of several subdivisions of the Department of State and of the Foreign Economic Administration on November 22nd.

On December 28th, the Secretary of State sent the following "Memorandum of Request" to the Joint Conference Committee:

> "The Department of State invites the Engineers Joint Conference Committee to prepare studies and proposals bearing upon the industrial disarmament of aggressor states.
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> "It is the belief of the Department of State that factual studies which can be made available through the cooperation of the membership of your various Engineering Societies will be most useful in the Government's consideration of this problem.
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> "It is of urgent importance that this work go forward rapidly. For the purpose of most effective integration with the factul studies which are in course of preparation within the Government, it is requested that the Engineers Joint Conference Committee frame its program of work in consultation with appropriate officers of the Department of State and the Foreign Economic Administration."

The limited authority of the Joint Conference Committee necessitated immediate organization of representative, specially qualified engineers to make the necessary studies and present their findings to the Government.

Accordingly, The National Engineers Committee was appointed and directed:

1. To prepare statements of the engineering, technical and industrial aspects of the problem.

2. To confer with the Joint Conference Committee in the selection of qualified engineers or groups of engineers to study and report upon such problems.

3. To receive such reports, to verify their correctness, to arrive at conclusions which seem proper and to submit such reports with the Committee's signature to the Joint Conference Committee and any approved interested individuals, groups and organizations.

The selection of eight task committees composed of engineers best qualified to study specific problems proceeded at once. Lieutenant General Lucius D. Clay, Deputy Military Governor, Office of Military Government for Germany appointed on March 30, 1945, wrote the following letter to Mr. Robert E. McConnell, Chairman, National Engineers Committee:

"I have been informed of the undertaking initiated by the Engineers Joint Conference Committee and its appointment of the National Engineers Committee to organize groups of engineers qualified to study and prepare reports and recommendations concerning the industrial disarmament of aggressor states. This represents an opportunity to call upon able engineers in the several fields to make important contributions to the planning for those measures intended to prevent another war. The importance of broad thinking by those best qualified can hardly be exaggerated. I hope the work will go forward as rapidly as is possible.

"You can be sure that these studies and reports will be given careful consideration and I am sure they will be of real value to us."

"Industrial Disarmament of Aggressor States (Germany) Report of the National Engineers Committee of Engineers Joint Council" was published and accepted by the Executive Committee, E. J. C., on September 24, 1945. Advance copies had been mailed to the Secretaries of State, War and Navy, Administrator Foreign Economic Administration, General Brehon Somervell, Commanding Army Service Forces; Lieutenant General Lucius D. Clay, Deputy Military Governor, Headquarters U. S. Control Council (Germany), and Hon. E. R. Stettinius, Jr., U. S. Delegate to United Nations Preparatory Commission, London.

On September 25th a telegram was received from General Somervell by Engineers Joint Council, quote:

"War Department advises no objection to publication of Committee's Report on Disarmament of Germany."

Thereupon, Council approved its release at a press conference on the following day.

In General Clay's letter dated September 26, 1945, acknowledging receipt of the Report, he stated:

"It has arrived in time for our consideration in determining plants available for reparations as well as to be destroyed and will be most helpful to us in this connection."

I quote General Clay's letter of October 6, 1945, to Robert E. McConnell, recording the latter's superlative services as Chairman of the National Engineers Committee while at the same time recruiting some 350 men for service in Germany.

"I have received the report of the National Engineers Committee with respect to the industrial disarmament of Germany and wish to express to you as chairman of the Committee in charge of preparing the report, and through you to all of those connected with the Engineers Joint Council and its constitutent societies, my personal appreciation of the contribution that has been made to this important problem.

"When I first discussed this matter some six months ago in Washington with you and Mr. Pirnie, I felt sure that the interest of so many of your associates in this question and the objective approach which their engineering training would insure, could not help but assist materially toward the elimination of Germany's war potential. I so expressed myself in my letter to you of 30 March 1945, and now, six months later, with the report in hand and the results of your work available to the Control Council, I am happy to confirm that the contribution made by your Committee will be of real help to us here.

"We have already received draft copies of the report and they have been under study by the Standard of Living Board and the Level of Industry Committee who have these problems under consideration.

"I also want to express my appreciation to you personally for the outstanding manner in which you have directly assisted our work here by personally heading up the recruiting of our economic personnel. Your devotion to this work in the War Department in spite of your physical condition is something I can never forget.

Most of the men holding important positions in our several economic divisions were selected either personally by you or under your direction, and I do not know how we could have gotten along without them.

"If by any chance your health would now permit you to take an active part in the work over here and you still feel that you would like to do so, there is no one I would welcome more."

On October 11th at a conference with General Somervell and Major General Frank R. McCoy, whose appointment by the President as head of the Far Eastern Advisory Commission was announced in the morning papers, General McCoy requested a dozen copies of the National Engineers Committee Report. A few days later the Belgian Embassy and Swedish Legation requested copies of the Report. Upon the approval of General McCoy by telephone, copies of the Report were sent to all Embassies or Legations of the United Nations in Washington.

On October 26th a statement on Science Legislation (S. 1297, S. 1285 and related Bills), prepared by a Panel of Engineers appointed by the Presidents of the Societies constituting Engineers Joint Council, was presented by the Panel to a joint committee of the Senate. Members of the Panel were:

Dr. Boris A. Bakhmetoff, Honorary Member, A.S.C.E.
Mr. Robert H. Morris, Director, A.I.M.E.
Prof. A. G. Christie, Past-President, A.S.M.E.
Mr. F. Malcolm Farmer, Past-President, A.I.E.E.
Prof. J. H. Rushton, Member, A.I.C.E.

This recital of freely given services of extremely busy members of the Engineering Profession to aid in the solution of technological problems confronting Government offers encouragement to all engineers in the discharge of their duty as citizens of a nation dedicated to the sanctity and freedom of the individual. For a brighter future in which even the existence of humanity is at stake, all engineers must give attention to broad technological problems. They must establish conclusions based upon knowledge of all branches of the profession and give the facts and conclusions to Government from international authorities down to the smallest subdivisions. This requires organization of the Profession for best qualified representation on specific problems at all levels of Government. Engineers Joint Council Committees on Organization of the Profession and on Status of the Engineer

are war-developments in engineering recognizing the importance of organization to facilitate effective services of engineers in discharge of their duty as citizens in a representative Government.

If engineers have deserved in the past such appraisal of their services to society as quoted below they must broaden their horizons of the future to concern themselves with the proper use of their creations claimed to be for "the convenience and benefit of man"

In an article entitled "Are Engineers Educated?", in the "Professional Engineer" (March, 1945), Baker Brownell, Ph.D., Northwestern University Professor of Philosophy and of Contemporary Thought, states in part:

> "Our industrial society travels on two legs. One leg is 20th century technology. Its main function is production. The other leg is 19th century business administration and finance. Its main function is to assemble capital, facilitate exchange and, particularly, to administer distribution. Unfortunately, the 19th century leg can't keep up with the 20th century leg.
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> "Twentieth century production is based largely on new abundances of goods and resources, on almost unlimited power to produce, on the recognition that modern mass production must go along with the generous consumption of goods by all the members of society, and on the smooth movement of goods to them. The engineer takes over the first two of these. For some reason, or for several reasons, he leaves the last two, having to do with consumption and distribution, to others.
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> "With one long leg and one short leg our industrial society travels in spurts and circles and then falls down. This is solemnly called the business cycle. . . .
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> "It is useless to make the business man the whipping boy for our troubles. He may have been bull-headed, but at least he has been willing to take responsibility for management in a modern world. . . Business men are about the only powerful group in modern society who have had the courage to undertake general problems and to deal with them operationally. While professional men have retired secretively into their cells and their specialized interests, the business men, at least, have been outside fighting it out in the more general problems of organization and survival. Things have not gone well, for courage without knowledge and enterprise without social responsibility are not enough to run a modern world. Other groups, particularly the engineers, must share in the blame for successive breakdowns.

"In general the engineer has not supported or engaged in great policy-making experiments. He has remained essentially a hired man, a consultant perhaps, but without voice in ultimate policy or planning.

"He has remained a hired hand, willing to do whatever he is paid for, largely because in training and outlook he is not a whole man. As the price of his specialism he has relinquished general social responsibility and turned over to others all consideration of the social and human consequences of his work. This is not true of all engineers, but seems to be true of most of them.

"He needs what his formal education usually fails to give—a knowledge of the social and human world in which he lives. He needs to know something of the bearing of these problems on the problems of technology and to have a sense of responsibility for them. He needs sensitive values and a sympathy with the aspiration of all human beings to live securely, productively, freely.

"Far more is involved in this than the merely personal enrichment of the engineer's life. He is a key man, perhaps the key man, of modern civilization. Engineers are needed in this desperate time, critically needed, who are able to face modern problems with breadth and dignity, with an understanding of human aspirations, and a sense of the tragedy of human frustration and defeat."

The priceless right and sacred duty of each of us is to contribute his best thought and available efforts to benefit society and to advise its representatives in Government. More effective organization of engineers from the smallest subdivisions of Government up to the international level is needed to bring engineers out of "cells" walled by "their special interests" and throw them into intimate contact with the varied interests of their neighbors.

Given four years of good technological training in college, the development of an engineer results from the use he makes of that training in his subsequent experience. Thus, in his post college years he must make friendly contacts with his fellow citizens in order to understand their problems and aspirations. He will then feel the urge to contribute his bit to the general welfare and will earn the grateful recognition he quite generally lacks today. He should join at least one of the Professional Engineering Societies covering his special interests and participate in its meetings and activities. He should also be registered to practice engineering in his resident State and thereupon join the National Society of Professional Engineers.

War development in joint action by engineers can be strengthened by perfecting the organization of the National Professional Engineering Socie-

ties. This will create a climate for growth of national engineering thought and objective approach to solution of important technological problems with adequate weight given to their impact upon the social and human world. Engineers who have joined in the work of the Committee for Economic Development and other groups of citizens trying to administer business, finance and distribution, which are eternally pressed by engineering production, have seen this expanded horizon. In continuing such contacts these engineers will become "whole men", the key men who will spur 19th century business and finance forward in the race with 20th century technology so that both may enter into the 21st century neck and neck.