The Technic Follows the Development of the Department of . . .

CHEMICAL AND METALLURGICAL ENGINEERING

by Professor JOHN BRIER

A man long associated with the Department of Chemical and Metallurgical Engineering here at Michigan discusses the old — and the new — looks of this curriculum.

On this the 75th Anniversary of the *Michigan Technic* I think it is well to pause and get away from the rush of today and consider the early events leading up to this modern age.

I cannot help but think back in my own personal memory to the early days of chemical engineering at Michigan.

Arriving on the campus as a freshman in the fall of 1908 I had occasion to confer with Professor Edward De Mille Campbell, who only ten years earlier had become the first chairman of the newly founded department of Chemical Engineering. Campbell (class of '86) had been appointed as Assistant Professor of Metallurgy in the Department of Chemistry following a group of illustrious chemists in that field.

Alfred Holmes White ('93, '04E) was appointed instructor in Chemical Technology in 1897 after his return from Switzerland where he had been studying. At that time Campbell who was teaching metallurgy organized and conducted one of the earliest courses in metallurgy given in the United States. To those of you who have become more or less familiar with such terms as ferrite, pearlite, martensite, as identities recognizable in steel when seen with the microscope, must realize the greatness of a man who blinded in his laboratory in 1892 not only had the courage but the ability to develop such a course without the aid of any assistants trained in this field.

It was a real inspiration to his students to see the way he overcame his handicap. I will always remember my first day as a student in his course in beginning "Quant"—he took apart and assembled a delicate analytical balance.

The demands for technical assistance in the infant chemical industry soon brought Campbell to realize that chemical technology must be reinforced with engineering know how.

In early 1898 Dean Green of the Engineering College asked for and received permission from the Regents to establish a course in Chemical Engineering.

At this time almost all of the first two years in the Engineering College were common to all Engineers. In the last two years additional Chemistry, the two courses by White in inorganic and organic Chemistry and the course in metallurgy by Campbell became the forerunners of Chemical Engineering. The first regular class in Chemical Engineering graduated with five members in 1903.

At this time the staff in Chemical Engineering consisted of Campbell and White but the work was so closely allied with Chemistry that Professor Moses Gomberg, head of Organic Chemistry, was an early counselor. Early in the history of Chemical Engineering the Staff felt the need for training in research and therefore introduced a Senior course of 5 hours credit designed to introduce the students to taking research.

At this early period all the courses in Chemical Engineering were listed in the Department of Chemistry. This may account for the fact that "a chemical engineer when talking to an engineer talked as a chemist while when talking to a chemist he really considered himself an engineer."

At any rate Chemical Engineering was beginning to "grow up" and its importance was recognized when Alfred H. White was promoted to Junior Professor of Chemical Engineering in 1908.

It is hard to realize that the first time Chemical Engineering courses were listed in the Announcement of the Engineering College was in 1908.

In 1909 the Department began to grow consisting of Professors Campbell and White and Instructor Karl Wilhelm Zimmershied ('03) who had been added to

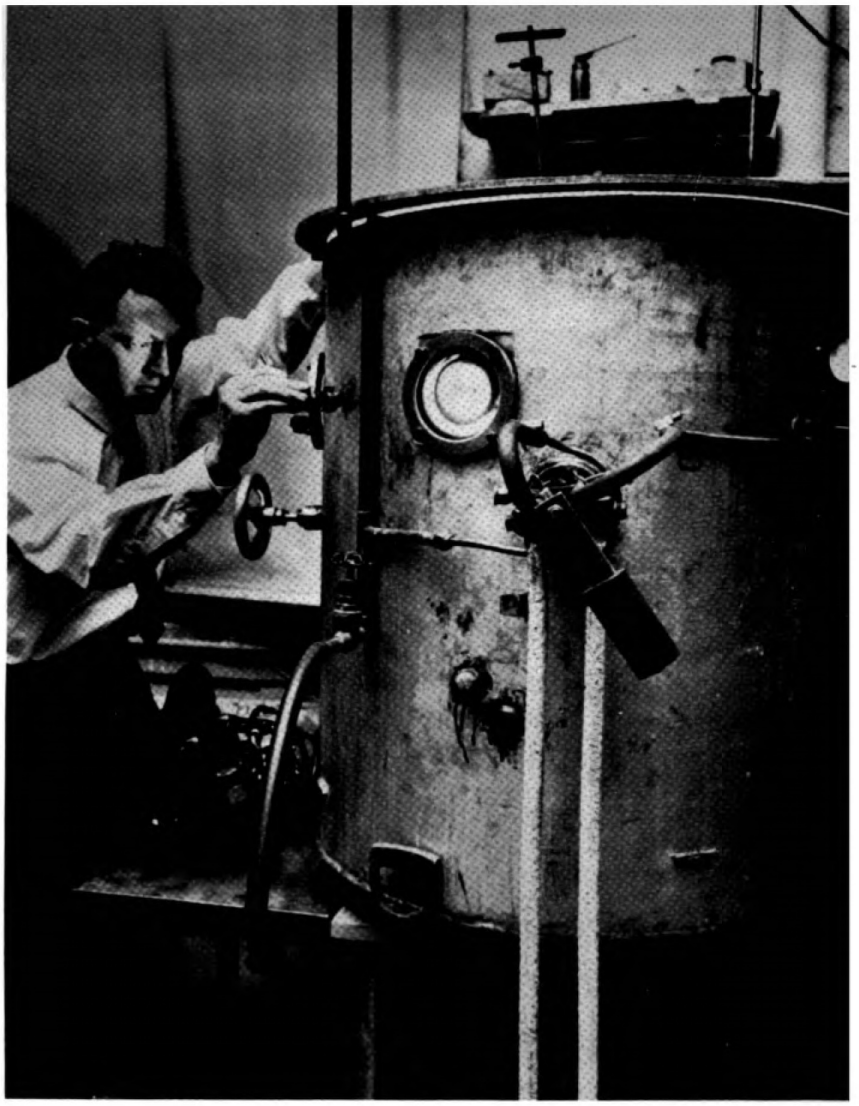

Fig. 10. High frequency furnace for melting research in vacuum or inert gases at the University of Michigan.

the Staff in 1908 to relieve Professor Campbell and expand the work in metallography and extractive metallurgy. Incidentally to those of you who are presently or recently have been struggling with the "Iron-Carbon" diagram, it was Zimmerschied or "Zim" as we knew him who first introduced me to its intricacies, Yes, I struggled too.

The speed at which Chemical Engineering was growing may be realized when in the next 5 years (i.e. to 1914), E. E. Ware in 1909, A. E. White in 1911, W. L. Badger in 1912 and John D. Rue in 1913 were added to the staff. A. E. White replaced Zimmershied who had resigned.

Professor Campbell's administrative work as Chairman of the Department of Chemistry and Director of the Chemical Laboratories demanded so much of his time that he resigned as Chairman of the Department of Chemical Engineering in 1914, turning it over to Prof. Alfred H. White.

Before passing away from the Campbell administration I must pay tribute to his work in enhancing the reputation of the department of Chemical Engineering at Michigan. Though his research work in the field of metallurgy cost him his eye-sight in 1892 his courage was not daunted. Many of the readers may remember Professor White's reference to Campbell's early work in Portland cement published in 1903.

Professors White and Campbell were very close to each other and perhaps it was White's remark to Campbell in a letter written from Zurich, Switzerland where he was studying at the Federal Polytechnicum that was the spark that touched off Professor Campbell's enthusiasm that resulted in establishing Chemical Engineering at Michigan. Knowing Professor White's forcefulness as I did, I think it very well might have been White who aroused Professor Campbell's interest in the courses in Chemical Technology being given there.

The date of 1914 may be considered as the end of the first phase in the development of Chemical Engineering.

The period beginning in 1911 when White was promoted to full professor was one in which he was organizing and laying a solid foundation for the future. The appointments of Ware, Rue, Badger, A. E. White and Upthegrove added momentum to the rapid development and growth of the department. Ware undertook to develop the protective coatings field and Rue started work and Research in a most important Michigan Industry, Pulp and Paper.

The advent of World War I in 1917 retarded development somewhat. The Army Ordnance suddenly realized that munitions of War required assistance from technical men in civil life, particularly Chemical Engineers, Metallurgists and Chemists. This need was met by recruiting faculty men from many colleges and universities.

Profs. A. H. White, Ware, Rue, A. E. White and Upthegrove were given leaves of absence and commissioned in the organized reserve. Professors A. E. White and Upthegrove being metallurgists played key parts in development of inspection and control of metal com-

ponents necessary in the production of ammunition. Professors A. H. White, Ware and Rue layed an important role in the early development of nitric acid production from the nitrogen of the air.

The departure of so many teachers from the department left only Professor W. L. Badger and Dr. Joseph Stanley Laird as permanent staff members. It was, therefore, necessary to seek additional assistance.

Dr. C. D. Holley was technical director of the Acme White Lead and Color Works in Detroit was appointed to act as chairman of the department on a part-time basis. William Platt Wood and the writer were appointed Assistant Professors

Clarence Smart and Franz Zimmerle, who were graduates of the department, served as instructors, as did Adolphe Wendler, who joined us in 1918.

It seemed advisable to secure an additional man of experience. Such a man was Edwin M. Baker who came to us as an instructor in 1918.

The war period was one of frenzied activity. The student body was augmented by the Student Army Training Corps. To keep these men on the beam was an academic experience that those of us who went through it will never forget.

Perhaps the most notable achievement of the war period was the starting of the evaporator laboratory. Badger, who by this time was dedicated to the development of unit operation, persuaded the Swenson Evaporator Company of Chicago to install a specially designed basket type vertical tube evaporator. It was especially designed for research work and was installed in the old boiler house directly back of the North end of West Engineering Building, now used as the ROTC rifle range. It was not an ideal spot but was the only one available. It was the forerunner of the present Unit Operations Laboratory where it is still in use in the East Engineering Building. Research work in the field of heat transfer was started and many valuable contributions to the literature were made by Badger and his doctoral students as a result.

At the close of the war, Professors Ware and Rue chose to forsake academic careers for the business world.

Professors Alfred H. White and A. E. White returned to the campus as Colonels and Professor Upthegrove as a Major.

To be sure, Professor Brier has been here at the University, in one capacity or another, as long as nearly anyone. His years between 1908 and 1912 were spent in preparation for his B.S. in chemistry. His M.S. came a year later in 1913. Prof. Brier worked in industry as director of research at the Holland Research Co. for several years prior to returning to his alma mater.

When asked to write an article on his department for this anniversary issue, he remarked: "Little did I realize that I should have the honor of writing this brief resume of chemical engineering and being a historian, when I was a student under, or a colleague with, every instructor and professor in the Department of Chemical Engineering."

Metallurgical engineering students have a well-equipped metals laboratory and foundry. Students are shown pouring an experimental mixture of alloy steel into a casting mould.

Of course, Holley and I returned to our respective jobs in industry.

Professor White immediately found himself confronted with the Herculean task of coping with a mushroom growth immediately after his return.

Eugene H. Leslie was added to the staff in 1919 and his interest in the field of petroleum industries played a very important part in the future trend of the department. G. G. Brown was appointed as instructor in 1920. The Dean tackled the job of acquiring a doctor's degree at the same time. He was one of Leslie's first students and his thesis work in petroleum research was "The Rate of Pressure Rise in Gaseous Explosion," of great importance in internal combustion engine design.

The development of the department during the period 1920 to 1942 saw great strides in the growth of chemical engineering.

Baker joined with Professor Badger in forwarding the development of Unit Operations and their book "Inorganic Technology" contributed to the evolution from descriptive to the quantitative approach in chemical engineering.

In 1931 Badger joined with McCabe in their classic "Elements of Chemical Engineering."

As an elementary text this book played

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a very vital part in forwarding chemical engineering.

With the moving of Chemical Engineering from the Chemistry Building to its present location and establishment of the Unit Operations Laboratory by Badger, Chemical Engineering was really on its way.

The field of petroleum technology was wide open to scientific attack and while Leslie started the ball rolling in this field, Dean Brown has been the real factor behind its development. His many contributions, both in men and publications, have played a tremendous part in the advancement of Chemical Engineering. To analyze the total impact of Brown's work with the properties of mixed hydrocarbons, particularly vapor-pressure relationships, would require much more space than has been allotted.

The application of thermodynamics in his field led Brown to realize chemical engineering education was deficient in the subject. During the period prior to World War II, he developed graduate courses in this field.

An interesting development began in the early Twenties when Professor White agreed to a request by the Navy to establish training in explosives for post graduate students of the Naval Academy. It fell to me to develop the explosive courses for these officers which they took as part of their required work for the MSSE in Chemical Engineering.

That the officers were a well-picked group is borne out when we realize some of their accomplishments. Their part in World War II was indeed important.

Admiral C. Turner Joy who struggled so patiently at the armistice table at Panmunjung at the close of the Korean War was one of the students in the first class at Michigan. Admiral Arleigh Burke, the present Chief of Naval Operations, received his M.S.E. from Michigan as one of the group in 1931. Incidentally, it may be of interest to many that Justice Talbot Smith of the Michigan Supreme Court was one of the early naval officers to receive his M.S.E. from Michigan in this naval program.

The work in explosives coupled with the presence of Col. Alfred H. White and Major Upthegrove * led to the establishment of summer schools for Ordnance Reserve officers in the field of ammunition laading. Upthegrove gave the work in metal component; Major Mickle ** gave work in gauging. It fell my lot to develop the explosive side of getting explosives properly loaded in shell, bombs, fuzes, etc.***

The success of these summer courses can be credited to Professor White, who as Colonel White, was our commanding officer.

The other important aspect of the period between the wars was the changes in metallurgical engineering which up to the later Twenties was primarily one of the elective groups in chemical engineering. By 1929, however, separate graduate programs in metallurgical engineering were recognized by the Graduate School and in 1935 the B.S.E. (Metallurgical Engineering) was established in the Engineering College and the Department of Chemical Engineering became the Department of Chemical and Metallurgical Engineering.

Over this period Wood and Upthegrove developed the work in ferrous and non-ferrous metallurgy.

A. E. White began the work in high temperature testing of creep in metal. Dr. Claude Clarke and Professor James Freeman devoted all their time as research engineers to this field. In the early Thirties, Dr. Schneidewind did a great deal of work in the kinetics of the malleableizing process. Actually his doctoral dissertation was in this field with Professor A .E. White being the chairman of his committee.

An outstanding addition to the metallurgical program was started when Professor A. H. White added Dr. Lars Thomassen to the staff as Assistant Professor to develop courses and laboratory work in x-rays. His work was of immeasurable value in this period in forwarding progress in chemical engineering.

The period of World War II might be designated a transition period.

Professor White retired in 1942 and Professor G. G. Brown took over the chairmanship until relinquishing it to Professor Donald L. Katz when G. G. Brown became our present Dean.

This I think should be a proper stopping point for "Glimpses into the past of chemical engineering." I should feel that I had left the department dangling in thin air and done an injustice to what I choose to call "The New Look in Chemical Engineering."

At the time the writer was called to active duty in the army in 1942 we were just getting underway in research on the rate of nitration of toluene with a graduate student [Clyde McKinley], Fortunately Prof. R. R. White was interested in the possibilities of this work and took charge of it as Desterol Committee Chairman of one of the graduate student.

The excellent work done in this field was rewarded with the awarding of The Junior Award in Chemical Engineering by the American Chemical Society in 1945 to Prof. R. R. White.

Banchero and York kept the Unit Operations program rolling during the war. Townsend the applied physical properties laboratory.

Since the war, development in chemical and Metallurgical Engineering has risen to a high pace, under the active influence of the young and younger generation of staff members. Remember "50 is the youth of old age."

In concluding these reminiscences "a glimpse into the early history of Chemical Engineering," I hope my many colleagues, particularly the post-war "youngsters" will forgive me for not adding more of a chapter on the "New Look" in Chemical and Metallurgical Engineering.

In conclusion I may have exceeded my allotment of space and time, but I know that the pioneers of Chemical and Metallurgical Engineering at Michigan who have passed on to the life eternal would never forgive me if I did not add their congratulations with mine to the Michigan TECHNIC on their outstanding accomplishments in this their 75th Centennial.

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* These men still held their commissions in the Ordnance Reserve Corps.

** of Mechanical Engineering.

*** Brier had been Command Major in the Specialist Reserve.