UNIVERSITY OF ILLINOIS

VOL. XXXV BULLETIN No. 62

ARTHUR NEWELL TALBOT LABORATORY

APRIL 1, 1938

PUBLISHED BY THE UNIVERSITY OF ILLINOIS

URBANA, ILLINOIS

A Tribute

to

Arthur Newell

Talbot

THE BOARD OF TRUSTEES AND THE FACULTY

OF THE

UNIVERSITY OF ILLINOIS

THROUGH

THE COLLEGE OF ENGINEERING

CORDIALLY INVITE YOU TO BE PRESENT ON

THURSDAY, APRIL TWENTY-FIRST
NINETEEN HUNDRED THIRTY-EIGHT

AT THE CONVOCATION AND DINNER SIGNALIZING THE OCCASION
AT WHICH THE MATERIALS TESTING LABORATORY
WILL BE RENAMED THE

ARTHUR NEWELL TALBOT LABORATORY

IN HONOR OF

PROFESSOR ARTHUR NEWELL TALBOT

WHO, AS A STUDENT, A TEACHER, AND A DIRECTOR OF RESEARCH,
HAS BEEN ASSOCIATED WITH THE UNIVERSITY OF
ILLINOIS FOR NEARLY SIXTY YEARS

URBANA

PROGRAM

•

Convocation

University Auditorium, 2:30 p.m.

Presiding: MELVIN LORENIUS ENGER
Dean of the College of Engineering

Statement of the Action of the Board of Trustees

The Honorable ORVILLE M. KARRAKER
Member of the Board

Remarks on the Action of the Trustees

ARTHUR CUTTS WILLARD
President of the University

Response

Professor ARTHUR NEWELL TALBOT

Address—Technology, Education, and Social Welfare

ROBERT ERNEST DOHERTY, Illinois '09
President of Carnegie Institute of Technology

•

Talbot Dinner

Woman's Building, 6:30 p.m.

Toastmaster: HERBERT FISHER MOORE
Research Professor of Engineering Materials

UNIVERSITY CONVOCATION

Signalizing the Occasion at Which the Materials
Testing Laboratory Will Be Renamed the

ARTHUR NEWELL TALBOT LABORATORY

University of Illinois Auditorium
Thursday, April 21, 1938, 2:30 p.m.

Program

Presiding: MELVIN LORENIUS ENGER
Dean of the College of Engineering

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The Honorable ORVILLE M. KARRAKER
Member of the Board

Remarks on the Action of the Trustees

ARTHUR CUTTS WILLARD
President of the University

Presentation of a Testimonial from the Students of the College of Engineering

WARREN JOHNSON
President of the Engineering Student Council

Response

Professor ARTHUR NEWELL TALBOT

Address—Technology, Education and Social Welfare

ROBERT ERNEST DOHERTY, Illinois '09
President of Carnegie Institute of Technology

Announcements

Following the Convocation, there will be opportunity for inspection of the Arthur Newell Talbot Laboratory and of other points of interest in the University.

IN COMMEMORATION OF

THE OCCASION AND CELEBRATION

ATTENDING THE CEREMONY OF

RENAMING THE

MATERIALS TESTING LABORATORY

THE

ARTHUR NEWELL TALBOT LABORATORY

APRIL TWENTY-FIRST

NINETEEN HUNDRED THIRTY-EIGHT

•

THE COLLEGE OF ENGINEERING

UNIVERSITY OF ILLINOIS

URBANA, ILLINOIS

Wright Street Entrance, Arthur Newell Talbot Laboratory

THIS VOLUME BRINGS TOGETHER IN BRIEF FORM SOME OF THE SALIENT FEATURES OF THE PROFESSIONAL LIFE OF PROFESSOR TALBOT, AND OF THE GROWTH AND DEVELOPMENT OF THE COLLEGE OF ENGINEERING OF THE UNIVERSITY OF ILLINOIS, ON THE OCCASION OF THE CEREMONY OF CHANGING THE NAME OF THE MATERIALS TESTING LABORATORY TO THE

ARTHUR NEWELL TALBOT
LABORATORY

THIS WRITTEN APPRECIATION HAS BEEN PREPARED BY THE ASSOCIATES AND COLLEAGUES OF PROFESSOR TALBOT, AND BY THE COLLEGE OF ENGINEERING, TO EXPRESS THE REGARD AND ESTEEM IN WHICH HE IS HELD AND TO EPITOMIZE THE PRINCIPAL FACTS AND EVENTS IN HIS LIFE AS AN ENGINEER, TEACHER, AND INVESTIGATOR.

PROGRAM

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Convocation

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Woman's Building, 6:30 p.m.

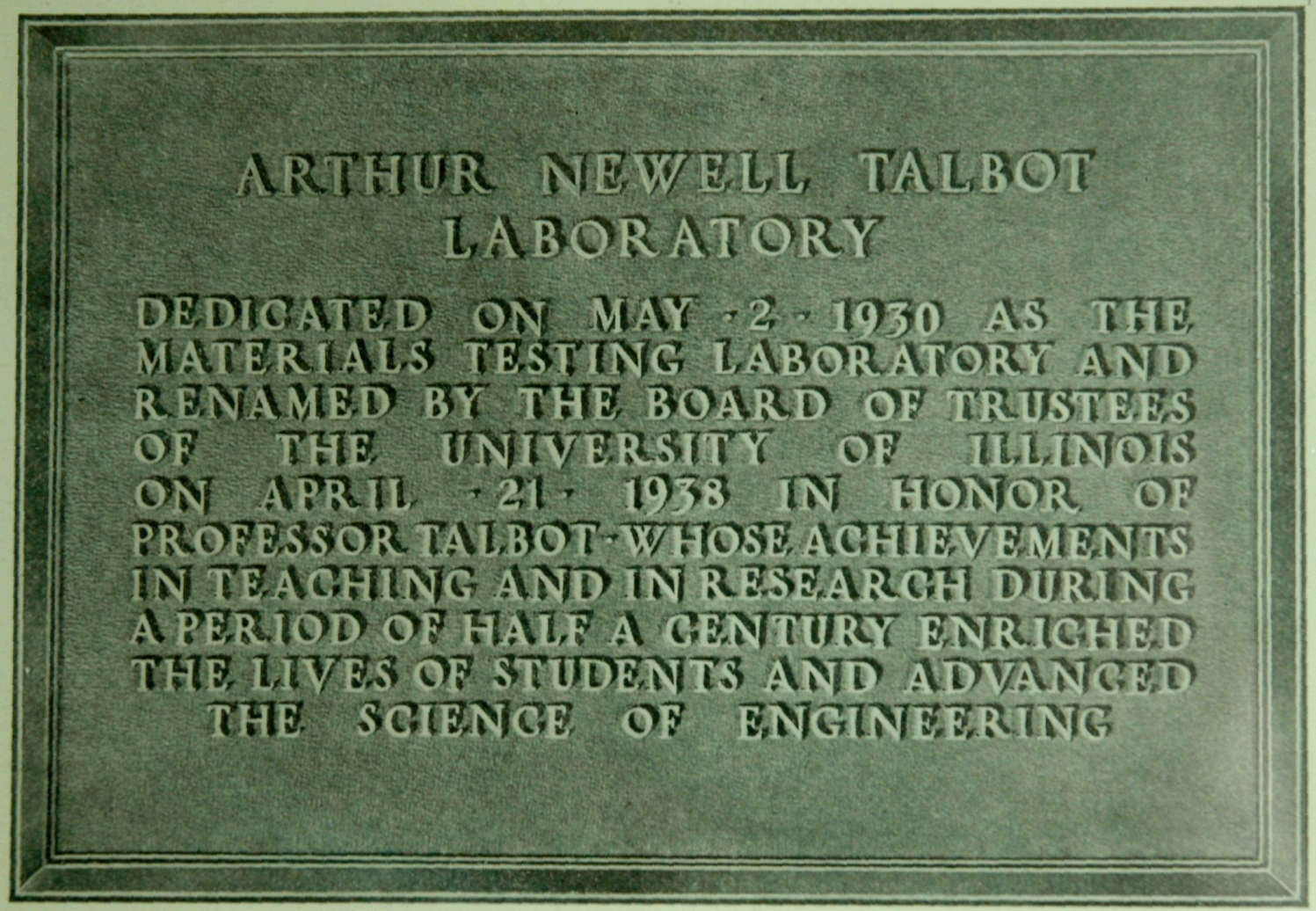
Toastmaster: HERBERT FISHER MOORE
Research Professor of Engineering Materials

FOREWORD

The University of Illinois takes this occasion to recognize and acclaim a distinguished son, Arthur Newell Talbot of the Class of 1881. Honors and awards, degrees and memberships, medals and tablets attest to the lifetime achievements in many scientific fields of Doctor Talbot, Professor of Municipal and Sanitary Engineering, *Emeritus*. Over a period of nearly sixty years his contributions to engineering education, research, and practice have grown more and more notable until today he is an acknowledged leader among engineering teachers, research organizers, scientific investigators and writers, and, above all, among men. Many generations of college students have gone forth from this institution inspired by his high standards, and impressed by his sterling character and unwavering devotion to his ideals. It now remains for his Alma Mater to signalize for future generations of students the enduring contributions of this man to the engineering profession by placing his name on a great materials testing laboratory at the University of Illinois.

A. C. Willard

President



BRONZE TABLET IN ARTHUR NEWELL TALBOT LABORATORY

(Placed in duplicate inside building near East and West Entrances)

SOME EVENTS IN THE HISTORY OF THE COLLEGE OF ENGINEERING

SEVENTY YEARS have elapsed since the opening of the College of Engineering of the University of Illinois, and within that period many scores of persons have shared in its development. It is obviously impossible, within the space here available, to deal adequately with the whole period, or even to mention any considerable number of those who have contributed to the College as we now know it. This sketch is therefore limited to a presentation of the progress of the first two decades (1868-1890)— the formative period with which but few are at all familiar — followed by very brief notice of some of the more important steps taken during the subsequent fifty years.

The University of Illinois was incorporated by an act of the General Assembly of the State on February 28, 1867. This action was taken under the terms of an act of the Federal Congress, known as the "Morrill Land Grant," whereby the national government was empowered to give to each state in the Union public land scrip equal to 30,000 acres for each senator and representative in Congress "for the endowment, support, and maintenance of at least one college whose leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts — in order to promote the liberal and classical education of the industrial classes in the several pursuits and professions of life." [Instruction was actually begun in the University on March 2, 1868.]

By the original act of the General Assembly the institution was called the "Illinois Industrial University" and it continued to be so styled until 1885 when its name was changed to the "University of Illinois." In addition to the original endowment

Congress has made additional provision for the Land Grant institutions by supplementary acts carrying annual appropriations—generally for specific purposes. The principal support of the University, however, is provided by the State of Illinois, partly through a special tax of one-third mill, and partly by appropriation from the general revenue.

At the first meeting of the Board of Trustees, on March 12, 1867, Dr. John Milton Gregory was appointed Regent and he continued in that office for thirteen years. Although, in response to the intention of the Morrill Act, work in agriculture and engineering was emphasized at the beginning, Dr. Gregory's conception of the functions of the new institution was much broader, and the work from the outset included courses in other branches of learning. In the first university catalog the admission requirements for the course in science, literature, and art included natural philosophy, physiology, algebra, geometry, and Latin grammar and literature. At first all courses were elective, thus anticipating a later widespread fashion in education. During the second year, however, curricula prevailing at other institutions were published in the catalog as "suggestions to students"; and fairly definite curricula in mechanical and civil engineering were "recommended" to engineering students. Two years later four engineering curricula were listed and, with few changes, continued in force for twenty years.

In the minds of the promoters and supporters of the Land Grant Act there lay a dissatisfaction with the standard classical education of the time and a desire for a type of training more closely related to the ordinary experience and life of the people. This desire was naturally reflected in the thought of the Trustees, the university Administration, and the people of the State. There were no precedents for the new type of training, and among its proponents there was a great diversity of opinion. This entailed for Regent Gregory the burdensome task of reconciling these views and of winning acquiescence and support for his own liberal and far-sighted conceptions. To

him, much more than to any other, must be given the credit for laying the foundations of the young institution with a breadth which permitted, a generation later, the erection thereon of the University as we find it to-day.

THE COLLEGE OF ENGINEERING

The Board of Trustees at its second meeting, in May 1867, adopted the report of its "Committee on Courses of Study and Faculty," consisting of the Regent and four members of the Board. This report provided for courses in mechanical science and art, in civil engineering, in mining engineering and metallurgy, and in architecture and fine arts.

Instruction began in a small way in the College of Engineering in 1868, as will be noted later, but it was when Stillman W. Robinson entered upon his duties as Professor of Mechanical Engineering on January 1, 1870, that instruction began in real earnest. Professor Robinson, then thirty-two years old, had been for the preceding three years Assistant Professor of Mining Engineering and Geodesy at the University of Michigan, where he had received his undergraduate training. With his arrival was inaugurated here the third attempt in this country to give instruction in mechanical engineering. Of those then responsible for the development of the College, he alone had definite ideas as to how to proceed. He was an advocate of combining practical with theoretical instruction, and was responsible for the inauguration of shop practice in the College. A man of fine and persuasive personality and an enthusiastic teacher, he soon enlisted the confidence and support of the Administration and Trustees and students. He made an impress on the educational aims and ideals of the new college which persisted over many years. He left the University in 1878 to go to Ohio State University.

Professor Robinson was followed by Dr. Selim H. Peabody, who was appointed Professor of Mechanical Engineering and Physics in 1878, and later became Regent of the University. As Regent, he continued for a time to teach the technical sub-

FACULTY OF THE COLLEGE OF ENGINEERING - UNIVERSITY OF ILLINOIS - 1904-05

1-A.R.CURTIS, (ME)
2-F.G.WILLSON, (EE)
3-J.M.SNODGRASS, (ME)
4-F.R.WATSON, (PHYS)
5-H.T.JONES, (ME)
6-G.A.GOODENOUGH, (ME)
7-A.P.CARMAN, (PHYS)
8-C.M.DAVISON, (ARCH)
9-L.G.PARKER, (CE)
10-D.L.SCROGGIN, (ME)
11-C.F.PERRY, (ME)
12-L.P.BRECKENRIDGE, (ME)
13-C.R.CLARK, (AE)
14-R.H.KUSS, (ME)
15-G.H.RUMP, (CE)
16-A.N.TALBOT, (T&AM)
17-H.L.RIETZ, (MATH)
18-A.H.SLUSS, (PHYS)
19-J.J.HARMAN, (ME)
20-D.T.RANDALL, (ME)
21-F.C.BROWN, (PHYS)
22-N.A.WELLS, (ARCH)
23-I.O.BAKER, (CE)
24-W.F.SCHULZ, (PHYS)
25-E.B.LYTLE, (MATH)
26-L.A.WATERBURY (CE)
27-R.I.WEBBER (CE)
28-N.C.RICKER, (DEAN)
29-J.M.BRYANT, (EE)
30-J.H.WILSON, (ME)
31-C.W.MALCOLM, (CE)
32-W.H.WILLIAMS, (EE)
33-C.T.KNIPP, (PHYS)
34-E.W.PONZER, (MATH)
35-O.A.LEUTWILER, (ME)
36-A.G.HALL, (MATH)
37-MORGAN BROOKS, (EE)
38-V.T WILSON, (GEO)

jects in mechanical engineering; but in 1881 he was succeeded by his son, Cecil H. Peabody, a graduate of Massachusetts Institute of Technology. He, in turn, was succeeded by Arthur Tennant Woods, a graduate of the U. S. Naval Academy, who in 1883 became Assistant Professor of Mechanical Engineering, and was for four years in virtual charge of the department under detail from the Navy Department. From 1887 until he resigned in 1891 he was formally in charge as Professor.

Work in civil engineering was begun in 1868 under the direction of Col. S. W. Shattuck who was appointed Assistant Professor of Mathematics and Instructor in Military Tactics in that year; being promoted the next year to Professor of Civil Engineering. He continued to teach mathematics, which by 1870 so occupied his time that the instruction in civil engineering was taken over by Professor Robinson. One year later, however, this work was assumed by J. Burkitt Webb, who was appointed Professor and Head of the Department in November, 1871, and continued in that position until 1878, when he resigned to go to Cornell University. Professor Webb was assisted by Ira O. Baker, who had graduated in this department in June, 1874, and was thereupon made Assistant in Civil Engineering and Physics. Upon Professor Webb's withdrawal Mr. Baker was in temporary charge of the department for one year; but in June, 1879, he was appointed Assistant Professor in charge, and in the following year became Professor of Civil Engineering. Professor Baker continued as Head of the department until 1915 and in 1920 resumed that office for two years. In all, he taught in the University for forty-eight years, during thirty-nine of which he was in charge of his department. Under his leadership it became one of the leading departments of civil engineering in the country and trained a large proportion of the most distinquished graduates of the College.

During the second of these two decades (1880-1885) Professor Baker was assisted by Jerome Sondericker, Assistant Professor of Engineering and Mathematics. Upon Professor Sondericker's resignation in 1885, his place was taken by

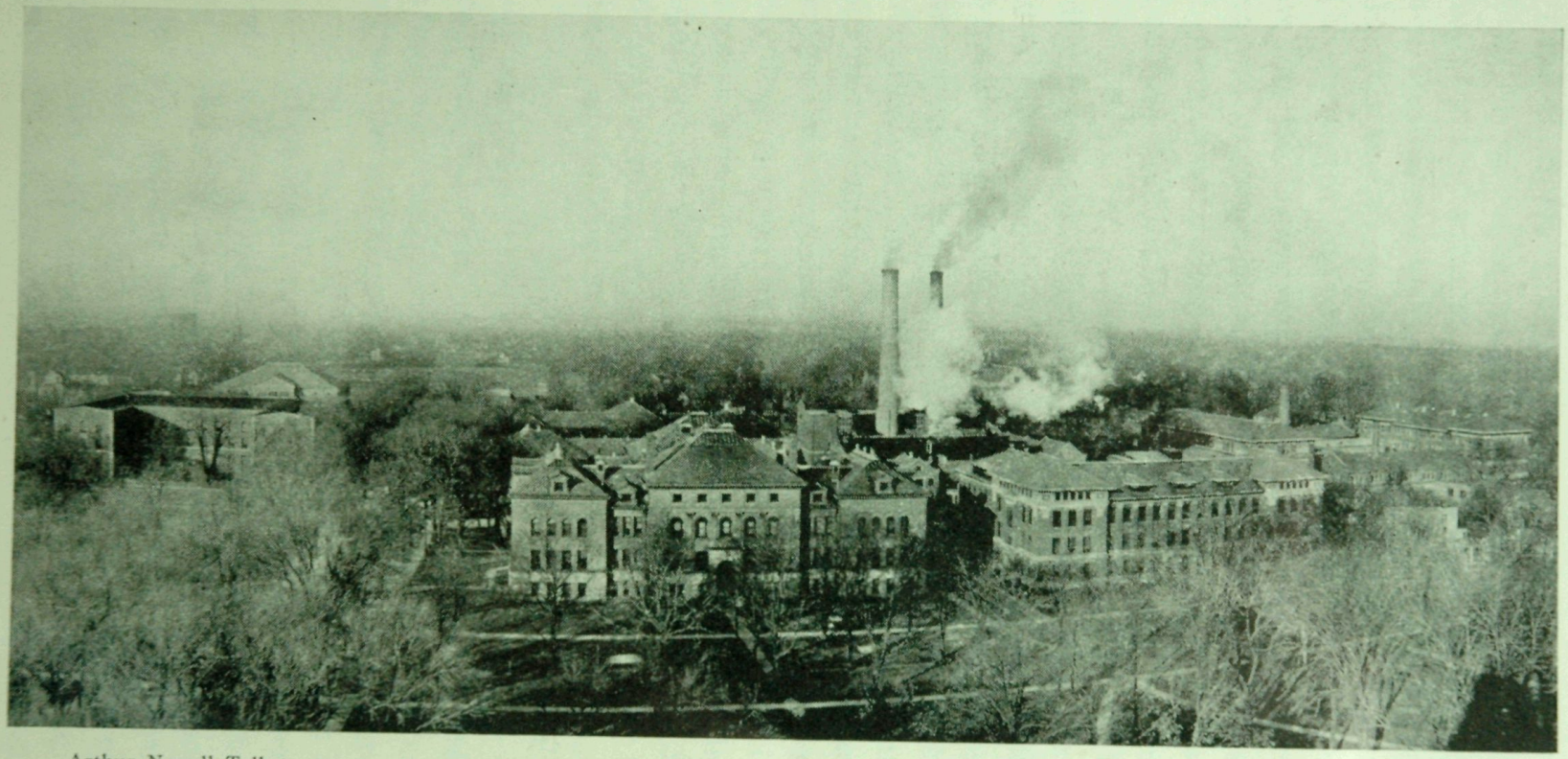
Arthur N. Talbot, who had graduated from the course in civil engineering in 1881 and had in this interval been employed in the west in railroad surveying, construction, and maintenance. He was employed as Assistant Professor of Civil Engineering and continued in this department until June, 1890, when he became Professor of Municipal and Sanitary Engineering and in charge also of the Department of Theoretical and Applied Mechanics. Professor Talbot's contributions to the development of the College are set forth elsewhere in this brochure.

Architecture was one of the four fields in which instruction was authorized by the Trustees in 1867; but when Clifford N. Ricker, the first student in architecture, arrived on January 2, 1870, he found that no instruction was yet provided in the technical subjects of that curriculum. These he was therefore compelled to study privately; and among students the tradition ran that he selected his own subjects, taught himself, examined himself, and reported his own grades. He graduated in 1872, being then twenty-nine years old. After a year spent in practice and in travel in Europe he returned to the University in 1873 and was placed in charge of the Department of Architecture — a position which he held continuously until June, 1910; for the first year as Assistant Professor, and thereafter as Professor. He at once arranged a four-year course in architecture; one of the three then available in the United States. The department, under his leadership, became one of the foremost in the country; its present excellent library is largely due to his unremitting zeal, for it was one of his main interests. No member of the faculty of the College has ever given to it his time and effort more unstintingly than Dr. Ricker, and none was a more untiring worker. Outside of his regular duties as a professor, he designed several of our existing University buildings and supervised their construction. Until 1890 his only assistant was the foreman of the carpenter shop. When he retired in 1916, Dr. Ricker had taught in the department for forty-three years and had directed its affairs for thirty-seven; and, in addition, had served the College as Dean for twenty-seven years.

Instruction in the last of the four original departments, Mining Engineering, was not begun until after 1871. It comprised courses in mining operations, taught by Professor S. W. Robinson, and work in mineralogy and metallurgy in the Department of Chemistry. In 1885 this work was taken over by Theodore B. Comstock, then appointed Professor of Mining Engineering and Physics. He resigned in 1889 and was succeeded by Walter J. Baldwin. This department, however, did not attract a sufficient number of students to warrant its continuance, and the work was abandoned in 1893—to be revived however sixteen years later.

For the first eighteen years of these two decades the work in physics was carried on by the Professors of Mechanical and Mining Engineering. In 1889 this work was taken over by Samuel W. Stratton, a graduate of the University, who two years later was promoted to Professor of Physics in charge of the Department and served until 1892 when he resigned to accept a position at the University of Chicago. He is given credit for initiating instruction in electrical engineering in 1890 and for establishing the first electrical engineering laboratory in 1891-92. Professor Stratton's ability is shown by the fact that in 1901 he was chosen as the first Director of the National Bureau of Standards and in 1922 he was made President of Massachusetts Institute of Technology.

The developments thus far discussed bring us up only to 1890, twenty years after the beginning of instruction in the College. Those in charge of the five departments then existing had been compelled to develop their curricula and methods with few, if any, precedents to guide them; and in the face of obstacles which it is difficult for us now to conceive—especially during the second decade, when the income from the endowment decreased and the other income failed to keep pace with the increasing enrollment and commitments. The number of engineering students at the middle of this period constituted about one-quarter, and in 1890 almost one-half, of the total number enrolled in the University. From then on this propor-



Arthur Newell Talbot Laboratory

Engineering Hall

Power Plant and Mechanical Engineering Laboratory

Physics Laboratory

Transportation, Mining and Ceramic Buildings

PANORAMIC VIEW OF COLLEGE OF ENGINEERING BUILDINGS, 1937
Taken from East Tower of University Hall

tion has decreased as the University expanded and new Colleges were established.

The developments of the next forty-eight years (1890-1938) are so numerous and the number of persons involved is so great that it is impossible, within the available space, to do more than to mention briefly a few of the principal new undertakings of the College. Soon after 1890 the State's appropriations began to be increased; and, in general, they have continued to increase. For the whole University these five decades are characterized by the establishment of new Colleges and Schools, with a corresponding increase in the variety of courses of instruction and research. The University enrollment has increased from 469 in 1890 to 12,928 in March of the current year.

In the College of Engineering the number of departments has increased from the five thus far cited to nine, which, with the dates of their establishment, are as follows:—

Ceramic Engineering, 1915
Civil Engineering, 1867
Electrical Engineering, 1890
General Engineering Drawing, 1921
Mechanical Engineering, 1867
Mining and Metallurgical Engineering, re-established 1909
Physics, 1890
Railway Engineering, 1906
Theoretical and Applied Mechanics, 1890

The Department of Architecture, authorized in 1867, remained in the College of Engineering until 1931 when it was removed and incorporated in the then newly-established College of Fine and Applied Arts. The Department of Municipal and Sanitary Engineering, organized within this period has now been merged in the Civil Engineering Department and the curriculum there administered as an option. With the organization in 1892 of the University Graduate School, graduate work in engineering, as in the other colleges, received a great impetus; and is now offered in all but one of the nine engineering departments.

Of the buildings now in use by the College, five had been built by 1900; namely, Electrical Engineering Laboratory and Annex, Engineering Hall, Machine Laboratory, and Mechanical Engineering Laboratory. Those added since that date are:—Ceramic Engineering Building and Laboratory, Locomotive Laboratory, Materials Testing Laboratory, Mining and Metallurgical Laboratory, Physics Laboratory, Transportation Building, and the Woodshop and Foundry. The most extensive recent addition to the physical equipment of the College is the Materials Testing Laboratory, which is now being renamed in honor of Professor Talbot.

Viewed with respect to its influence upon the research function of the College, the enhancement of its usefulness to the engineering profession and to industry, the stimulation of the faculty and students, and its effect on the reputation of the College, probably the most important event in this later period was the establishment of the Engineering Experiment Station which was authorized by the Trustees on December 8, 1903. It was the first research organization of its kind in any college in this country and has served as a model for the many which have since been established elsewhere.

The chief credit for the conception and advocacy of this enterprise belongs to Dr. Lester Paige Breckenridge, who since September, 1893, had been Head of the Department of Mechanical Engineering. For several years he had tried to secure action of the federal Congress authorizing the establishment in engineering schools of experiment stations similar to those which, by congressional action, had been created in colleges of agriculture. Though he failed in this, the idea of establishing an engineering experiment station at the University of Illinois was kept alive. In December 1902, in its list of askings for Legislative Appropriations, the Board of Trustees asked, in a separate bill, for funds to enlarge the College of Engineering. Opportunity was given the engineering faculty to seek the assistance of alumni and the manufacturing and constructional interests of the State in support of such an appropriation. To

the gratification of the university administration the Legislature recognized the needs of the College and in May 1903 passed the general bill with an item of $150,000 for the maintenance and extension of the engineering equipment. On the basis of a report, prepared after careful consideration by the heads of the engineering departments, Dr. Draper presented to the Board of Trustees a recommendation that a part of the $150,000 be used for the purchase of land, buildings, and equipment for undergraduate instruction. Further, he recommended that a State Engineering Experiment Station be established, and that the remainder of the appropriation ($77,000) be used for the purchase of apparatus having special reference to advanced work in engineering research and to experimentation in engineering problems, this research to be carried out by the regular departments. The recommendations of Dr. Draper were adopted by the Board of Trustees December 8, 1903, and the Engineering Experiment Station thus came into being. Throughout this time the leadership of Professor Breckenridge was an influential factor in the consummation of the whole project. From the beginning the aims of the Station have been to stimulate engineering research, to enrich engineering education, and to investigate problems of importance to the profession and to the manufacturing, railway, mining, and other industrial interests.

Professor Breckenridge became, appropriately, the first Director of the Station and continued to direct its affairs until he resigned in 1909, to become Professor of Mechanical Engineering at Yale University. Since that time the office and title of Director has been held by the Dean of the College. The control of the Station's activities is vested in an executive staff composed of the Director, the heads of the engineering departments, and the Professor of Chemical Engineering. The Station's work is conducted by a research staff of men who devote all, or nearly all, of their time to its investigations, and by various members of the teaching staff who are interested

in and qualified for research. Supervisory control of the work is exercised by the members of the Executive Staff.

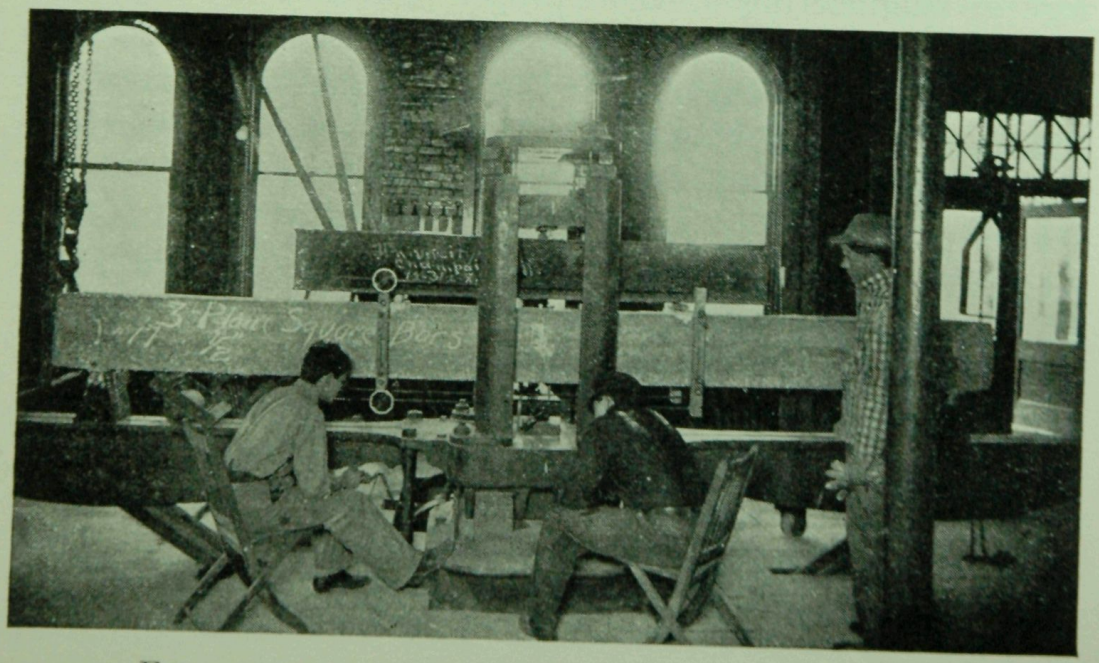
Some of the Station's work is carried out on the initiative of the members of its staff and by means of Station funds; much of it, on the other hand, is done in cooperation with professional and industrial agencies, which share the expense with the Station. The latter, however, under the terms of the standard agreement, retains full control of the investigations and the right to publish the results. These results are published in bulletins, circulars, and reprints, of which the numbers thus far issued are, respectively, 300, 31, and 11. These publications are distributed to nearly all countries, and some of them have been translated into a half dozen or more foreign languages. They are as much esteemed abroad as at home, and they have widely extended the reputation of the College. Of the first twenty Station Bulletins, Professor Talbot is the author of six; and his skill as an investigator and precision as a writer did much to set the pace for the Station's publications.

Since its inception the office of Dean of the College of Engineering has been held by eight persons. The faculties of the four original colleges of the University were first organized in 1878. At the first meeting of the faculty of the College of Engineering, held in February, 1878, Professor Stillman W. Robinson was the Dean. Dr. Nathan C. Ricker was elected Dean in the fall of that same year, and he held that office for twenty-seven years—until June, 1905. He was immediately succeeded by James M. White, Professor of Architectural Engineering, who served as Acting Dean until June, 1907, when he resigned that office to become Supervising Architect of the University. His successor was William F. M. Goss, who resigned as head of the engineering schools at Purdue University to become Dean of the College of Engineering at Illinois. Arriving in the fall of 1907, he continued in this office until March, 1917, being, however, on leave of absence from July 1, 1913, until August 31, 1915. During Dean Goss's absence Pro-

fessor Charles Russ Richards, Head of the Department of Mechanical Engineering, served as Acting Dean. He became Dean of the College on March 1, 1917 (upon Dr. Goss's resignation), and continued in that position until July, 1922, when he resigned to become President of Lehigh University. The office was then assumed by Milo S. Ketchum, who had graduated in the Department of Civil Engineering in 1895. After twenty-seven years of professional and educational experience he became Dean of the College on September 1, 1922. Because of ill health he resigned that office on September 1, 1933. Dean Ketchum was succeeded by Arthur C. Willard, then Head of the Department of Mechanical Engineering. Professor Willard, unwilling to accept the office permanently, became Acting Dean in September, 1933, and held that office until July, 1934, when he became President of the University. The present incumbent, Melvin L. Enger, for thirty-one years a member of the faculty of the Department of Theoretical and Applied Mechanics and for eight years its Head, became Dean of the College on July 1, 1934.

In closing this brief recital of the development of the College of Engineering it seems proper to record the expansion which has taken place in it, a condition of growth common to other engineering schools. An engineering enrollment of one hundred in 1887-1888 has in fifty years become seventeen hundred and the organized research which began in 1903 has grown to an average yearly expenditure of $160,000 for the past ten years, resulting in the issue of twenty technical bulletins per year for that period. Even though these exhibits are statistical they, in a measure, indicate that engineering education and research have grown to be important elements in the social fabric of the nation.

LABORATORY OF APPLIED MECHANICS. BUILT IN 1902



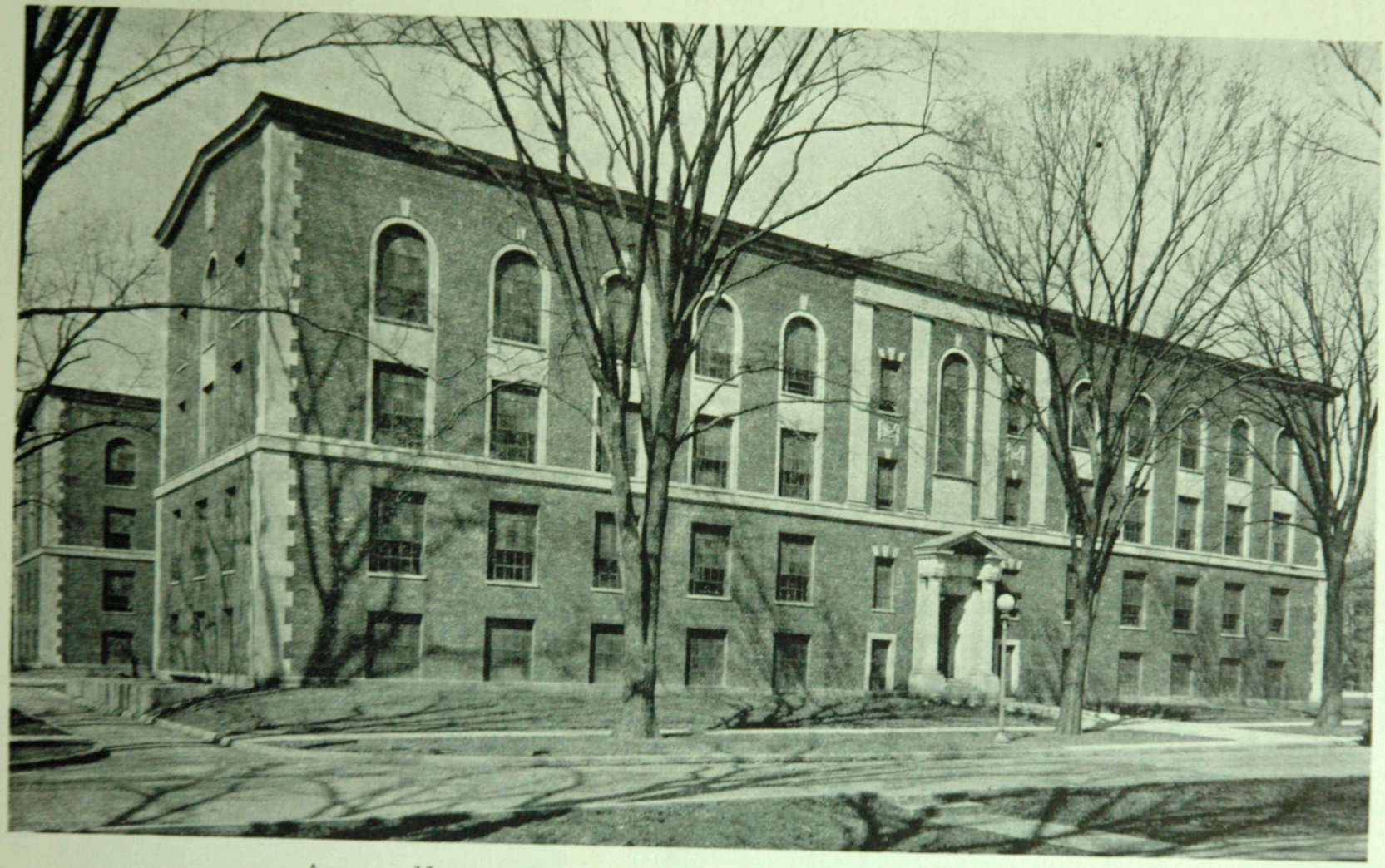
EXPERIMENTAL WORK IN REINFORCED CONCRETE, 1904

THE ARTHUR NEWELL TALBOT LABORATORY AND ITS PREDECESSOR

THE USE of the laboratory as a means of teaching is a relatively new idea in engineering instruction. Regarded with suspicion when it was first introduced in a small way about 1870, it rapidly proved its worth as a teaching method. Over fifty years ago, using homemade equipment and devising his own methods, Professor Talbot began to give instruction in laboratory work in materials and hydraulics. Fifteen years after the beginning of this work the Laboratory of Applied Mechanics was built, and in it Professor Talbot, together with his students and his associates, directed and carried out a large amount of important work, much of it pioneer in character, in applied mechanics. This teaching and the related investigations became so extensive and diversified that, within ten years, the confines of the Laboratory of Applied Mechanics were outgrown and the work spread into other buildings. Finally, in 1929, three years after Professor Talbot, by reason of age limitations, had retired from active service in the University, there was built the large, well-equipped laboratory now being renamed.

This building, which provides space for the Department of Theoretical and Applied Mechanics and a part of the work of the Department of Civil Engineering, is four stories in height, built in the form of an H with two wings 187 by 50 feet, and a stem 110 by 92 feet. It is equipped with a 10-ton traveling crane and with a great variety of testing equipment, including testing machines with capacities ranging from 45 pounds to 3,000,000 pounds.

Although only eight years old, this building is already crowded almost to capacity with undergraduate student instruction, with advanced graduate work, and with research investigations ranging from those carried on by instructors in their spare time to those occupying the full time of twenty to

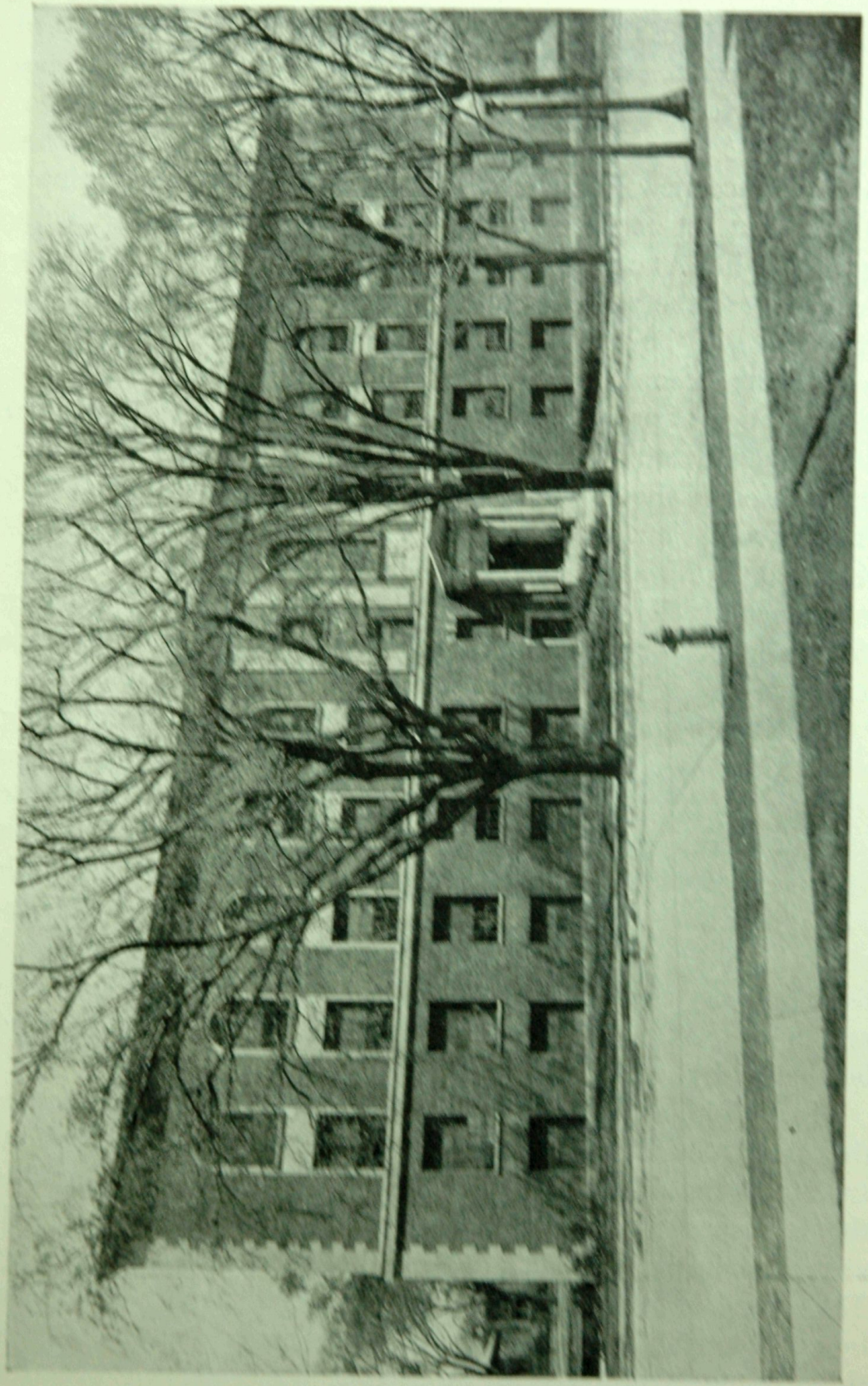


ARTHUR NEWELL TALBOT LABORATORY FROM BURRILL AVENUE

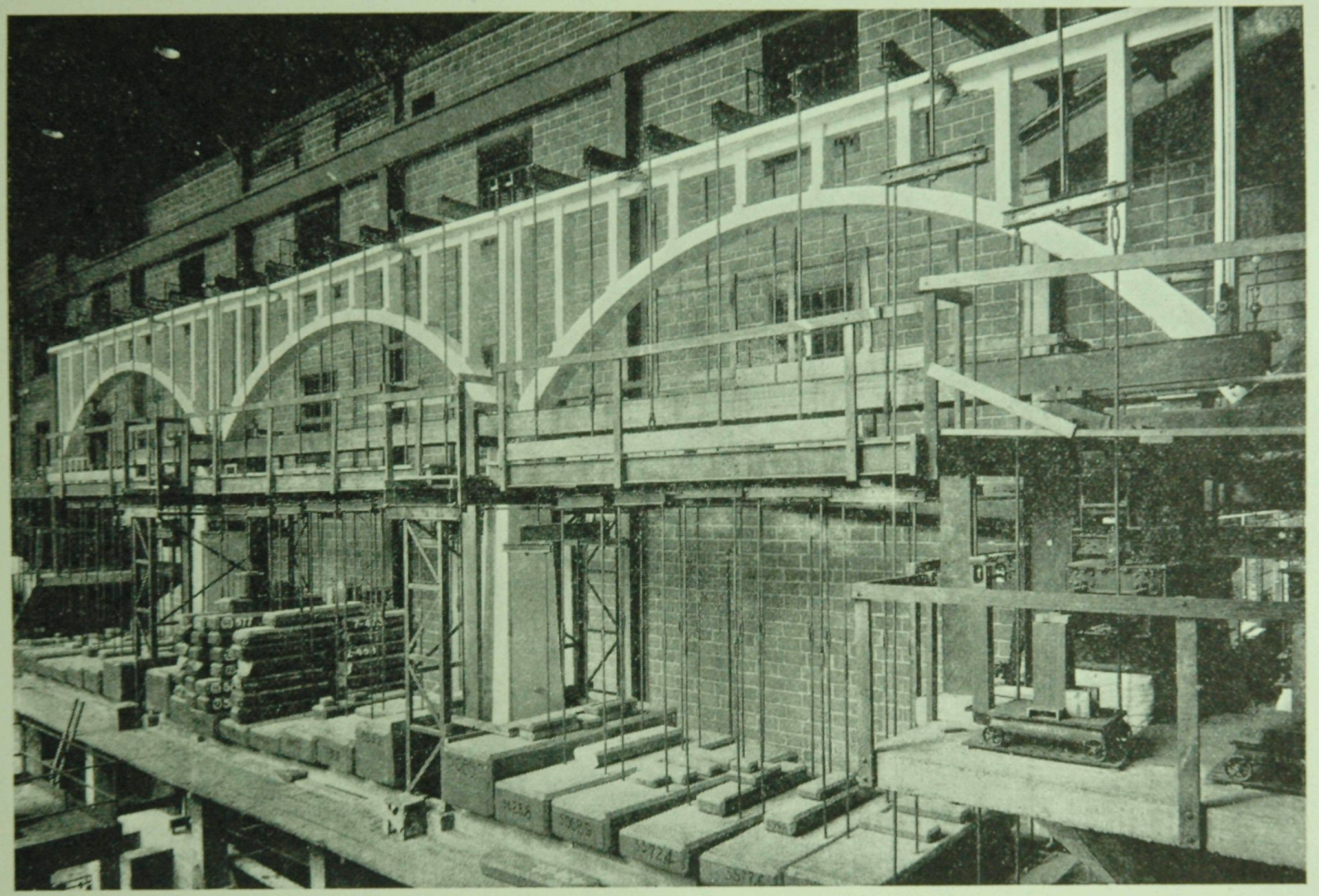
thirty men. Like the work carried on in the old Laboratory of Applied Mechanics, the activities in the Arthur Newell Talbot Laboratory continue to foster an educational and research program. This program has in view three purposes: To promote and advance new knowledge; to educate and train graduate students in the methods of conducting research; and, finally and most important, to teach and develop undergraduate students. Here the undergraduate student sees for himself new knowledge in the making and he is encouraged in his regular courses in mechanics, materials, and hydraulics to enter into the investigation of problems. These investigations serve to broaden his horizon, to stimulate self-reliance, and to cultivate initiative. In addition to the enriching effect of this investigational work on the professional attitude of the student, the facilities available also permit experiments to be made in methods of laboratory teaching. These experimental studies are needed in order to keep laboratory teaching abreast of other improvements in teaching, and of the progress in engineering itself.

Among the investigations now under way are those dealing with problems in hydraulics, with the production of gas from sewage, the stresses in railroad track, the cause of transverse fissures in rails, the welding of railroad rails, the distribution of concentrated loads on reinforced concrete slabs, the strength of rigid frames of reinforced concrete, the properties of low-alloy high-strength steels, the creep of metals at elevated temperatures, and the effect of repeated stress on various steels and alloys, as well as on full-size structural members and welded and riveted joints.

Inspired by the traditions of its predecessor it is expected that the Arthur Newell Talbot Laboratory will continue to contribute to the discovery and formulation of new ideas and to the development of students who, possessed of effective knowledge and initiative, will advance the science of engineering. These students will aid their profession and society in general by applying the basic principles of the science of mechanics to the solution of problems in industry and engineering practice.

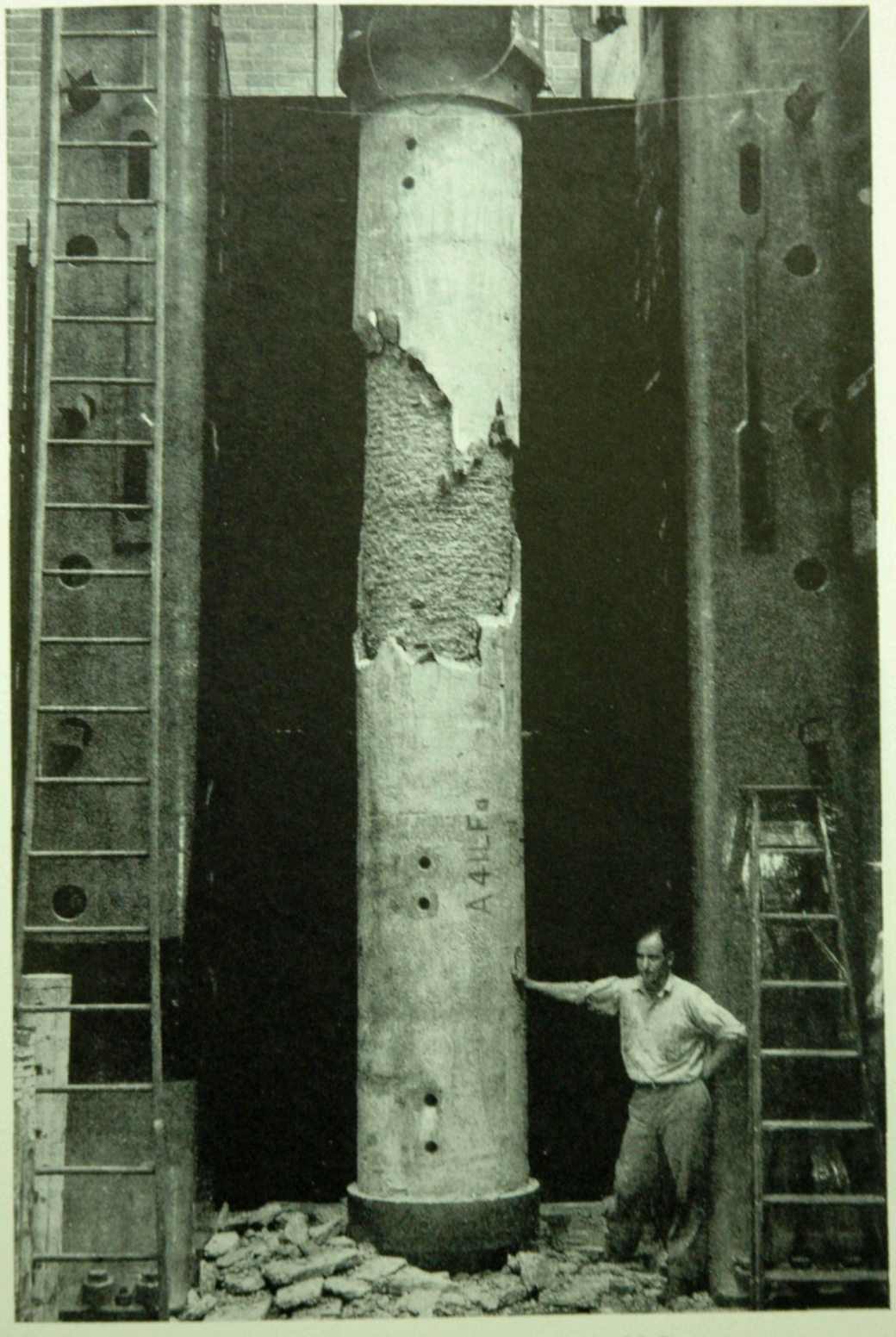


ARTHUR NEWELL TALBOT LABORATORY FROM WRIGHT STREET

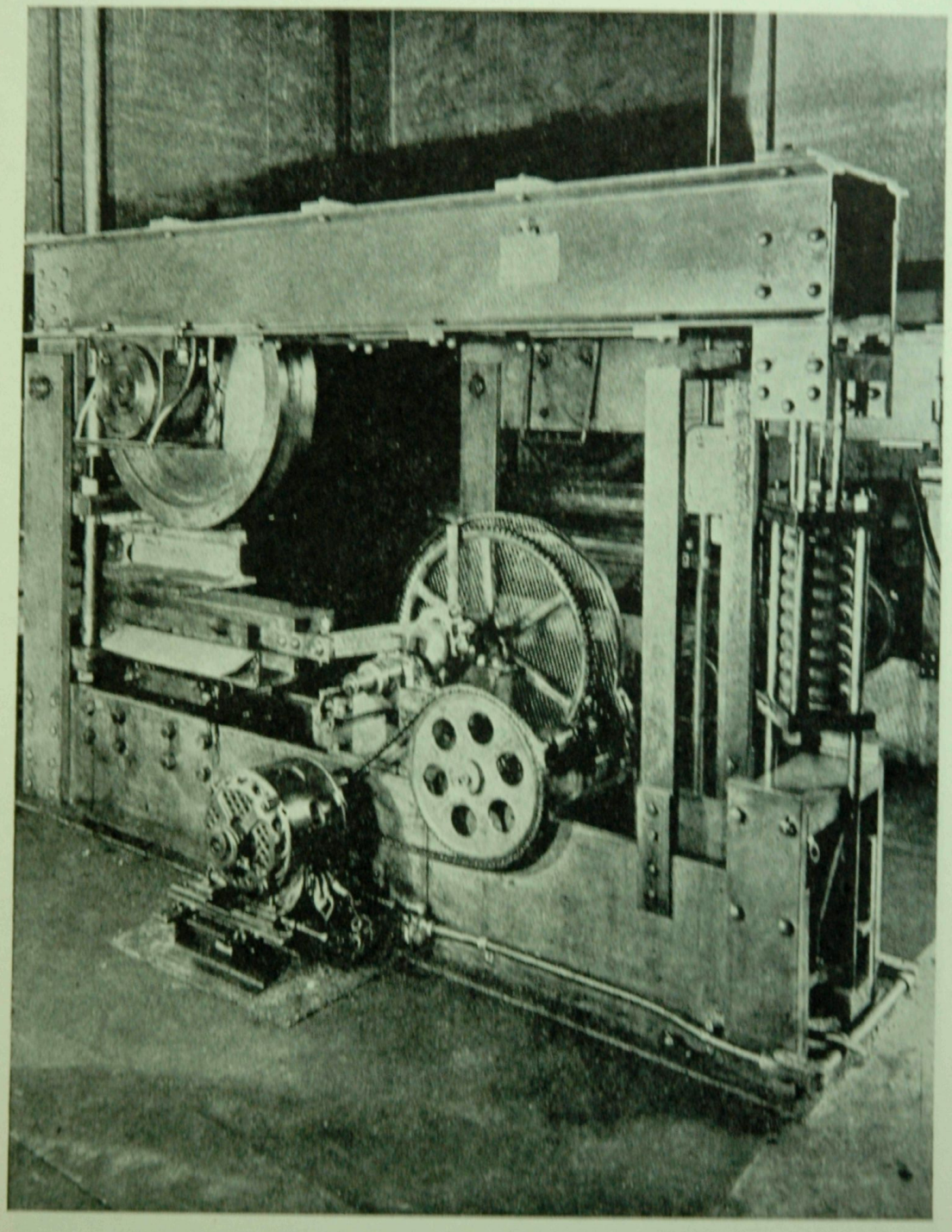


CRANE BAY, ARTHUR NEWELL TALBOT LABORATORY, SHOWING RESEARCH ON CONCRETE ARCHES

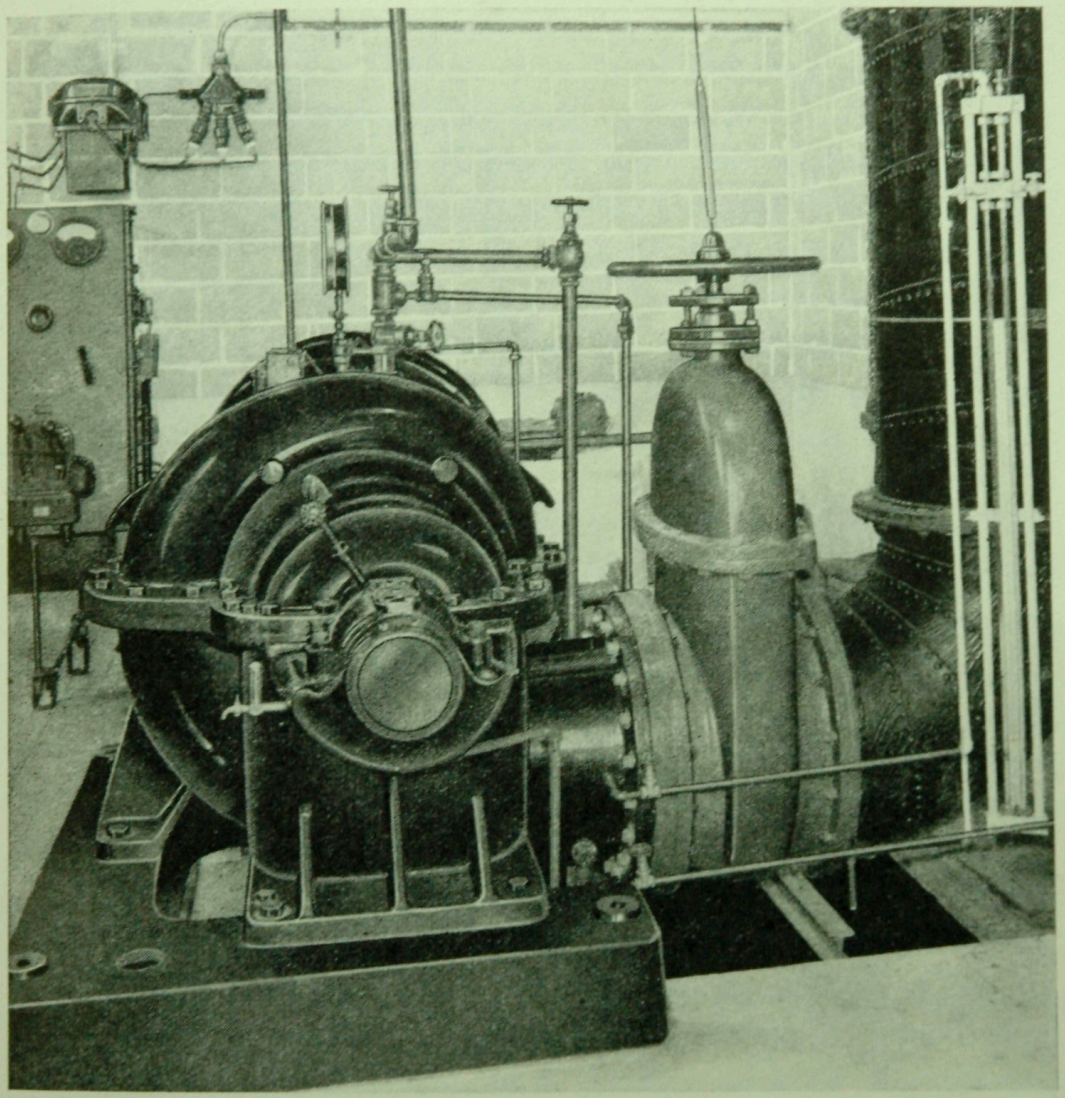
CRANE BAY, ARTHUR NEWELL TALBOT LABORATORY, SHOWING
3 000 000-POUND TESTING MACHINE IN OPERATION



TEST OF REINFORCED CONCRETE COLUMN 32 INCHES IN DIAMETER AND 18 FEET LONG



STRESSING RAILROAD RAILS TO FAILURE UNDER REPEATED LOADS



One of the Centrifugal Pumps Supplying Water to the Hydraulic Laboratory

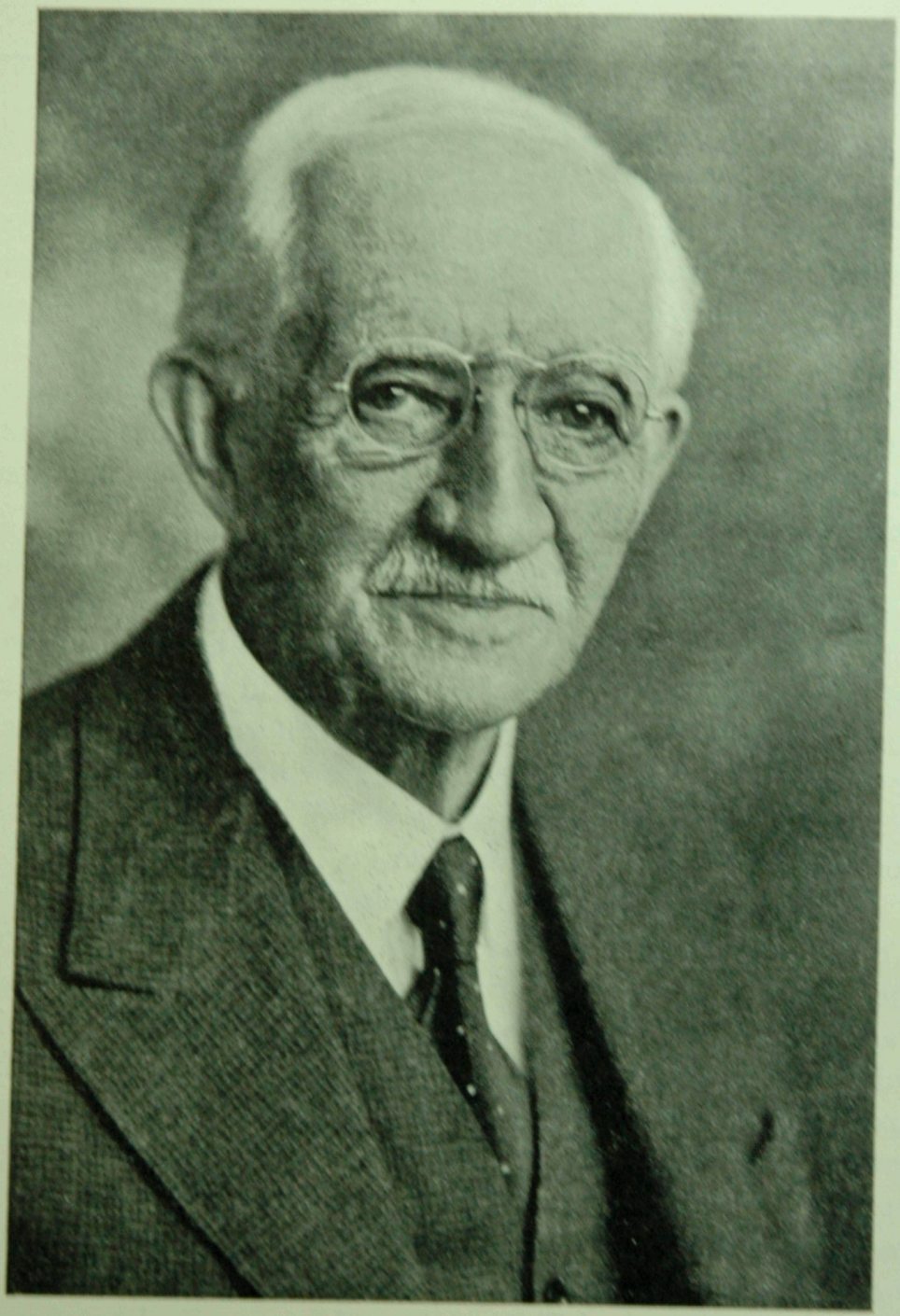
BIOGRAPHY OF ARTHUR NEWELL TALBOT

Prepared and presented six months after his eightieth birthday

ARTHUR NEWELL TALBOT was born October 21, 1857, at Cortland, Illinois. His father, Charles A. Talbot, was born in London, England, and his mother, Harriet Newell Talbot, was born in Brockville, Ontario. Both had been brought as children to the new settlements in northern Illinois in the tide of immigration, principally from New York and New England, which began after the close of the Blackhawk War. Young Talbot's early life was lived under pioneer conditions among the sturdy people who were developing new homes in a prairie land.

His early education was in the school in Cortland, a village about 55 miles west of Chicago, and in the high school at Sycamore. While he was yet a young lad his grandfather Newell had recognized his aptitude in mathematical matters and encouraged the boy by giving him problems beyond his age, such, for example, as the calculation of the time of sunrise on a given day. After completing his high school course he taught a country district school for two years.

In 1877 he entered the University of Illinois, then known as the Illinois Industrial University, to study civil engineering. The University at that time had about 300 students of collegiate grade. Here he came in contact with Ira Osborn Baker who had begun his long career as a teacher of civil engineering three years earlier and was already beginning to attract attention. Talbot was a brilliant student, indeed his scholastic average remained the record for many years. However, he did not devote all of his time and energy to study but was active in extra curricular activities. He was Secretary, Vice President, and President of Philomathean Literary Society, Associate Editor of the *Illini,* delegate to the Interstate Oratorical Association, Class Essayist, a leading officer in the student govern-



PROFESSOR TALBOT AS HE APPEARS TODAY

ment, the ranking officer in the Cadet Corps, and entered into other student activities. In addition to these activities, he gave instruction in preparatory mathematics and in his senior year was a student assistant in Physics.

The literary society was the major student activity during the time Talbot was a student. He took a prominent part in the Philomathean Society. The titles of his addresses to the Society covered a wide range of subjects. His Commencement Oration, delivered in June, 1881, was "A Defense of the Public Schools." It cannot be doubted that his interest in student literary activities and the training he then received helped to develop the precision and clearness in speech and writing which has been one of his outstanding characteristics.

After graduation in June, 1881, he went west and was for four years engaged in railroad location, construction, and maintenance in Colorado, New Mexico, Kansas, and Idaho. The nature of the experience and responsibilities was of the kind to develop a young man in the conduct of affairs.

In September, 1885, he returned to the University of Illinois as Assistant Professor of Engineering and Mathematics and taught a wide range of subjects, which at different times included mathematics, surveying, engineering drawing, contracts and specifications, roads and pavements, railroad engineering, mechanics and materials, hydraulics, tunneling and explosives, water supply, and sewerage. In 1890 his title was made Professor of Municipal and Sanitary Engineering, in charge of Theoretical and Applied Mechanics. After the era of expansion in engineering schools began, mechanics and engineering materials absorbed his attention even more than sanitary engineering, and without a change in title the emphasis of his work continued to be placed on mechanics and materials. For more than forty years he moulded and inspired generations of young men and was a leader in the development and advances made in this growing engineering school. Always he regarded teaching as the important part of his life work. He

Professor Talbot in 1886

continued in this position until he reached the age limit of the University in September, 1926, when he retired from teaching and administration and was made Professor of Municipal and Sanitary Engineering, *Emeritus*. Since his retirement he has been actively engaged in directing an extensive research program.

On June 7, 1886, Professor Talbot married Virginia Mann Hammet in Camargo, Illinois. She was a classmate and active in student affairs. She was a member of Alethenai Literary Society, a member of the College Senate, and President of the Oratorical Association. To them four children were born: Kenneth Hammet Talbot, Engineer, United States Bureau of Reclamation; Mildred Virginia, wife of Professor H. J. Gilkey, Iowa State College, Ames, Iowa; Rachel Harriet, wife of Dean Harald M. Westergaard, Harvard Graduate School of Engineering, Cambridge, Massachusetts; and Dorothy Newell, wife of Mr. Warren F. Goodell, Loda, Illinois. Mrs. Talbot was a charming, cultured woman, devoted to her husband and children. She died December 4, 1919.

Before the turn of the century Professor Talbot had made contributions to the engineering profession in a number of fields which brought distinction to him and to the College of Engineering. One of the earliest was a formula for areas of waterways for bridges and culverts. Another was a formula for rates of maximum rainfall. Both formulas have been often quoted and widely used and bear his name today. A small treatise on a very flexible method for laying out easement curves at the ends of circular curves (first described by him in 1891) was published in 1899 as "The Railway Transition Spiral" and has gone through several editions and has been used by many railroads. His pioneer work in sewage treatment by means of septic tanks later made it possible for municipalities to contest certain patent claims on methods and principles of sewage disposal. During this period his investigations provided methods for the standardization of testing paving brick

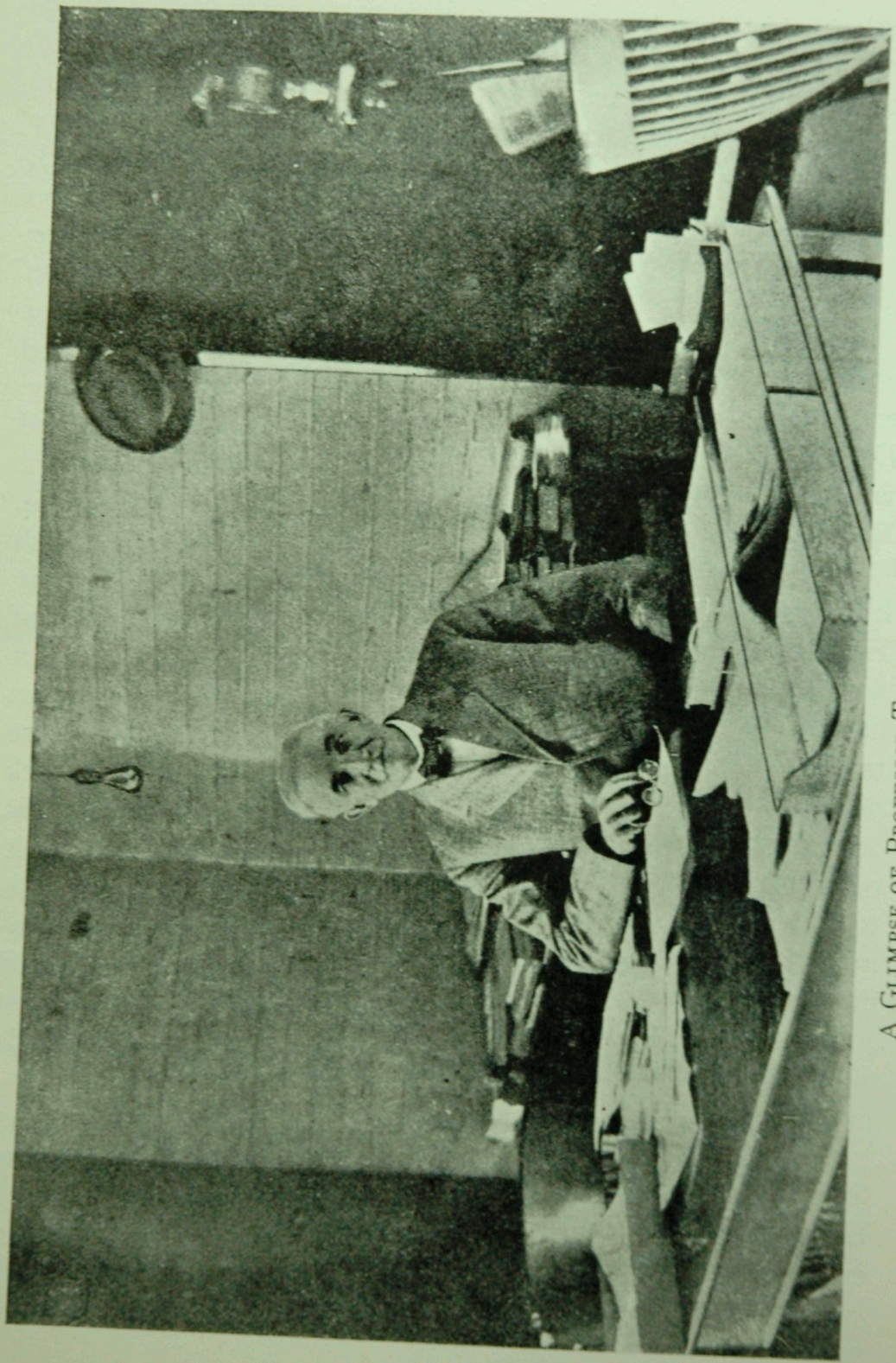
for strength and abrasion. Before the age of forty years he had made important contributions in hydrology, railway engineering, sanitary engineering, and testing materials.

Professor Talbot's work before 1900 brought him distinction. During that period he developed a background of experience and a ripened judgment which prepared him to take full advantage of the increased facilities which were provided when the Engineering Experiment Station was organized. He was active and influential in the formation of the Station. His leadership in formulating policies, ideals, and methods made the Engineering Experiment Station an immediate success. A comprehensive and thorough investigation on reinforced concrete, conducted and directed by him, was started in 1903 and continued for many years on reinforced concrete beams, slabs, columns, footings, pipes, frames, and buildings. This experimental work became a principal source of the early knowledge on which the properties and requirements for the design of reinforced concrete structures were based by engineers and engineering organizations and on which principles and methods of practice were formulated. The conception of relations existing between the strength of a concrete mixture and items involving the absolute volume of the cement, the fine and coarse aggregate, and the voids in the mixture, as well as the so-called relative water content of the mixture, put forth in a paper in 1921, and in a later bulletin, has proved useful to concrete engineers. Tests of stone, brick and concrete, the investigation of steel columns and timber stringers, and a variety of other experimental and analytical work have also added to engineering knowledge. Contributions were also made in experimental hydraulics.

A notable piece of research which Doctor Talbot has directed since 1914 is the investigation of railroad track, commonly called "Stresses in Railroad Track." This investigation has been conducted with a view of obtaining definite and authoritative information on the properties, mode of action, and

resistances developed in the various parts of the track structure (rail, ties, ballast, and roadbed) under the application of locomotives and cars moving at various speeds. At the time the work was begun, comparatively little of a scientific nature was known of the stresses in rail and other parts of the track or of the effect on the track of the many variations in action of the rolling stock in its operation. Through the twenty years, with the help of a trained staff, a multitude of tests have been made with various types of locomotives and cars on track of more than twenty railroads in various parts of the country, and experimental work has also been conducted in the laboratory. Data from all these tests have been interpreted and coordinated with analytical treatment to establish principles and findings. Besides various minor reports of this engineering research, Doctor Talbot has prepared six formal reports all of which have been printed in the Proceedings of the American Railway Engineering Association and part also in the Transactions of the American Society of Civil Engineers. This research project has produced reliable knowledge on the interrelation between track and rolling stock and thus has aided in putting on a more nearly rational basis the design and construction of the track structure to carry locomotives and cars under modern traffic conditions, as well as giving valuable information applicable to the design of rolling stock. Commendation by railroad engineers in important executive and supervisory positions is indicative of the value placed on the investigation by men fitted to pass judgment. It has been characterized as one of the most significant contributions to the scientific knowledge of railroads ever made.

Doctor Talbot's written contributions are along numerous lines. The reports of the University of Illinois Engineering Experiment Station researches on concrete and reinforced concrete are given in seventeen Station bulletins, with five other bulletins on hydraulics, timber, steel columns, etc. Reports on concrete, reinforced concrete, cast-iron water pipe, methods

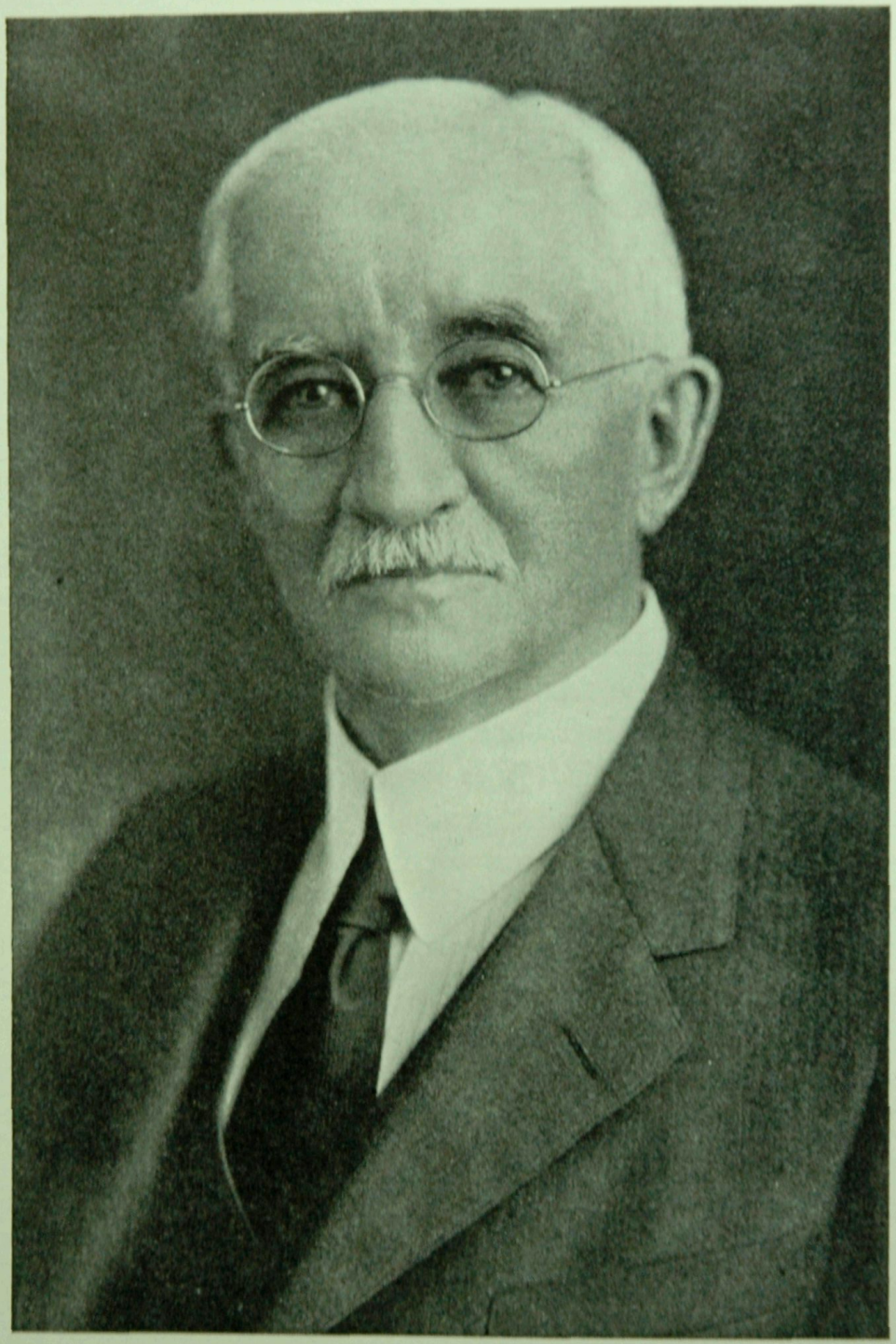


A Glimpse of Professor Talbot at His Desk in 1909

of testing, and other topics may be found in the Proceedings of the American Society for Testing Materials. The report of the first Joint Committee on Concrete and Reinforced Concrete, in the preparation of which he participated, was published by several technical societies. A fairly complete list of Doctor Talbot's technical publications will be found on pages 49 to 64. Various non-technical articles and addresses have also been written.

Doctor Talbot exercised a far-reaching influence on engineering developments through committee activity in engineering societies. Taking a leading part in the work of the first joint committee on Concrete and Reinforced Concrete (1904-1916) as a representative of the American Society of Civil Engineers, he was influential in formulating principles and methods of design based on the tests he had made and upon other data and analyses. As chairman of the sub-committee on design, he formulated and advocated many of the views that were adopted by the committee. The report of this committee exercised a marked influence, among engineers and architects, on the ideas and practices in engineering design and on building regulations, in the pioneer period of reinforced concrete construction. Most of the fundamentals of design then put forth are still accepted. The tests of reinforced concrete made at the Illinois laboratory were widely used by engineering schools and thus the information spread even more rapidly to engineering offices. In the field of testing materials he has been active in the American Society for Testing Materials since its beginnings in 1898 and has taken a leading part in the work of several of the technical committees that have done constructive work. In sanitary engineering, in railway engineering, and in municipal lines he has contributed to technical committee work and in other ways

Doctor Talbot has attained high rank among engineering teachers and has been influential in the Society for the Promotion of Engineering Education since its formation in 1893,



Professor Talbot in 1922

holding various offices including that of president. He has been prominent in the work of the American Society of Civil Engineers, serving on its research committee and on other committees and on its Board of Direction; he was president of the Society in 1918. He was president of the American Society for Testing Materials in 1913-1914. He is a member of a number of other engineering societies, including the Institution of Civil Engineers, American Society of Mechanical Engineers, Western Society of Engineers, American Railway Engineering Association, American Concrete Institute, American Water Works Association, American Public Health Association, American Association for the Advancement of Science. In all these he has given service in one way or another by writing or direction.

Doctor Talbot by reason of ability, aptitude in teaching, scholarly attainments, and discriminating judgment has been, and continues to be, an active participant in the planning and in the development of the College of Engineering. He made a noteworthy contribution in the development of laboratories dealing with the testing of materials and structural elements. Starting with a small testing machine in 1888, the facilities have grown to those of the laboratory now housed in the building which is hereafter to bear his name. The development of an hydraulics laboratory whose useful and unique features have been carried over into the new building was another contribution. For both of these early laboratories, and their successors, the variety and completeness of the facilities and the productiveness of the research activities testify to the usefulness of the developments. Few laboratories have produced as great a variety of experimentation and as influential a series of experimental researches.

In his long career as an administrator, Doctor Talbot has selected and trained many men for teaching and research. He has always taken a great interest in the men on his staff and has used various means to promote their progress and develop-

ment. Those associated with him could not be unaffected by the force of his example, by his high ideals, and by his strong personality. Among those who have worked with Doctor Talbot are many men in all parts of the world who have become leaders in education and research.

After taking up teaching work, he continued during vacations and at other times to engage in engineering work on railroad construction, on pavements, sewerage and water works, and on reinforced concrete design and construction. He has acted as consultant to cities and business organizations on various occasions. He served on a board to determine the type of structure for the Galveston causeway and was one of a board in 1927 to make a preliminary report on the location of a bridge over the San Francisco Bay between San Francisco and Oakland. However, his research and administrative work and his connections with technical committees have so occupied his time and energy that he has limited the principal contributions of his life to engineering education, engineering research, and the utilization of the fruits of research through engineering society channels.

A portrait of Professor Talbot, painted by Ralph Clarkson of Chicago, was presented to the University by former students, colleagues, and other friends. The portrait hangs in the Engineering Library. The formal presentation was made by Doctor W. L. Abbott, '84, at a convocation of the College of Engineering on March 27, 1925. The principal speaker at the convocation, Edward J. Mehren, '06, Vice President of the McGraw-Hill Company, after a biographical sketch of Professor Talbot's life and activities and a critical estimate of the value of his work to society, concluded as follows:

> This is his great achievement. This is the work that makes him brother of those giants who since the days of Watt have been bearers of gifts to humanity. Into that grand galaxy of engineers' names fits worthily his name, the name of our teacher, our inspiring leader in science and in engineering, our lovable friend, Professor Arthur Newell Talbot.

HONORS AND AWARDS

DEGREES

Doctor of Science, University of Pennsylvania (1915).

Doctor of Engineering, University of Michigan (1916).

Doctor of Laws, University of Illinois (1931).

HONORARY MEMBERSHIPS

Institution of Structural Engineers, London (1913).

American Society for Testing Materials (1923).

Illinois Society of Engineers (1924).

American Society of Civil Engineers (1925).

Western Society of Engineers (1927).

American Water Works Association (1930).

American Concrete Institute (1932).

American Railway Engineering Association (1933).

Medals Bestowed Upon Professor Talbot

MEDALS AND AWARDS

The Washington Award of the Western Society of Engineers—"For pre-eminent services in promoting the public welfare, for his life work as student and teacher, investigator and writer and for his enduring contribution to the science of engineering." (1924)

The George Henderson Medal by the Franklin Institute—"No. 5 for Invention in Railway Engineering." (1924)

A Tablet at Urbana and Champaign Sanitary District Building, among other things, states: "On this site, 1897, The Champaign Septic Tank was Built. Designed by Prof. A. N. Talbot. It was among the first of its kind in this country." (1924)

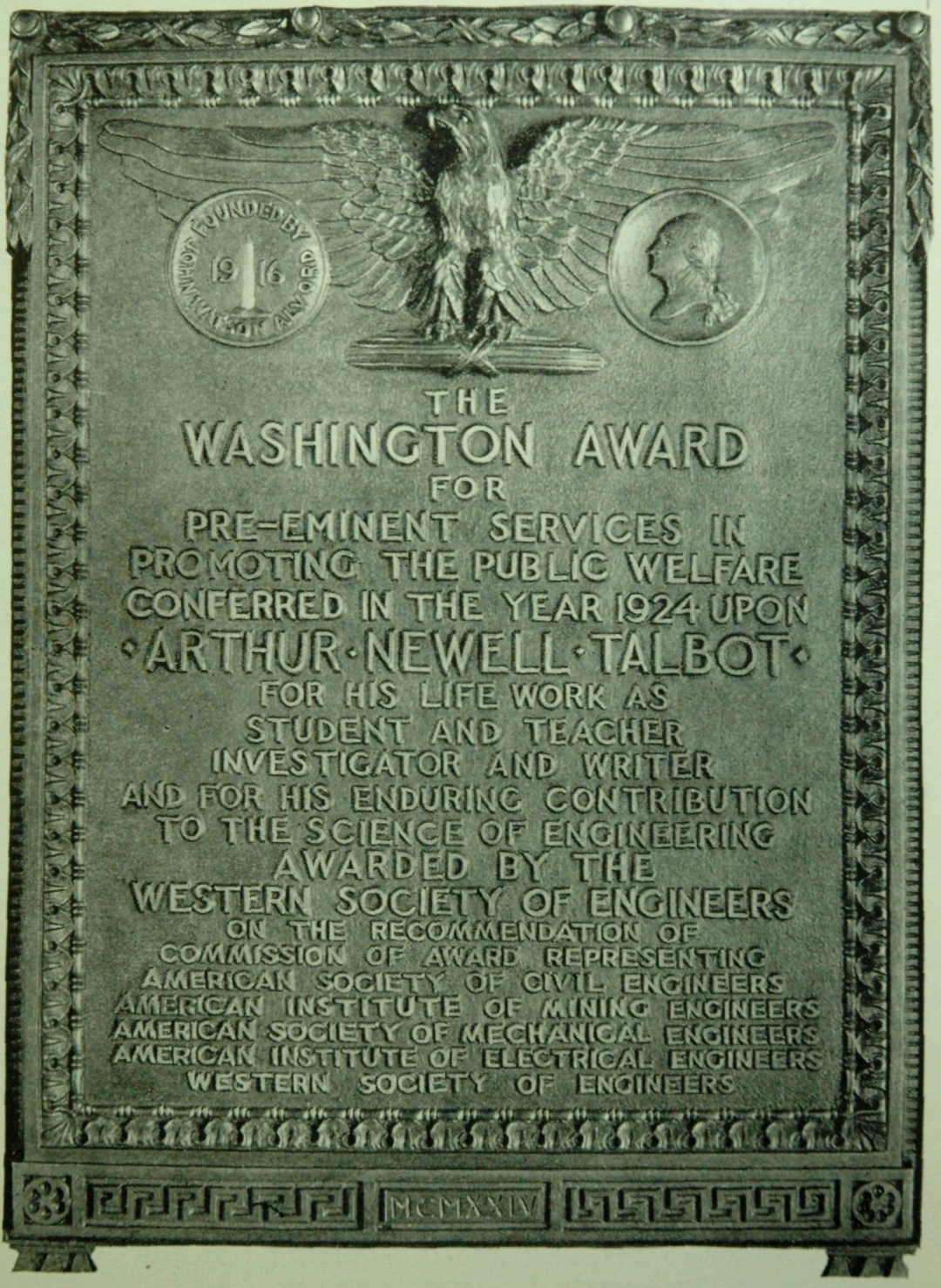
Bronze Plaque by American Railway Engineering Association reading "An appreciation to Arthur Newell Talbot, worker in research and scientific advancement," accompanied by resolutions reciting ". . . . its high appreciation of you as a scientist, and teacher, and investigator and organizer, and, last but not least, as a man." (1925)

The Henry C. Turner Medal by the American Concrete Institute—"For outstanding contributions to the knowledge of reinforced concrete design and construction." (1928)

The Benjamin Garver Lamme Medal by the Society for the Promotion of Engineering Education—For "Achievement in Engineering Education." (1932)

A Bronze Tablet by Students—"Honors the Achievements of Arthur Newell Talbot and His Contributions to Engineering and the Prestige of the College of Engineering, University of Illinois." (1937)

The John Fritz Medal by the United Engineering Societies—"Moulder of men, eminent consultant on engineering projects, leader of research and outstanding educator in civil engineering." (1937)


FOUNDED BY JOHN FRITZ MEDAL AWARD
1916
THE
WASHINGTON AWARD
FOR
PRE-EMINENT SERVICES IN
PROMOTING THE PUBLIC WELFARE
CONFERRED IN THE YEAR 1924 UPON
·ARTHUR·NEWELL·TALBOT·
FOR HIS LIFE WORK AS
STUDENT AND TEACHER
INVESTIGATOR AND WRITER
AND FOR HIS ENDURING CONTRIBUTION
TO THE SCIENCE OF ENGINEERING
AWARDED BY THE
WESTERN SOCIETY OF ENGINEERS
ON THE RECOMMENDATION OF
COMMISSION OF AWARD REPRESENTING
AMERICAN SOCIETY OF CIVIL ENGINEERS
AMERICAN INSTITUTE OF MINING ENGINEERS
AMERICAN SOCIETY OF MECHANICAL ENGINEERS
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
WESTERN SOCIETY OF ENGINEERS
MCMXXIV

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"Notes on Mountain Railroad Location." *Technograph,* No. 1, 1886, pp. 51–54.

"The Determination of Water-Way for Bridges and Culverts." *Technograph,* No. 2, 1887, pp. 14–22.

Discussion of paper on "Railway Trestles" by E. A. Hill. *Proc. Ill. Soc. Eng. and Surv.,* Vol. II, 1887, p. 130.

"Some Track Problems." *Technograph,* No. 3, 1888, pp. 39–43.

"Report of Committee on Exhibit and Exchange of Drawings" (with others). *Proc. Ill. Soc. Eng. and Surv.,* Vol. III, 1888, pp. 151–153.

"An Ideal System of Numbers." *Technograph,* No. 4, 1889, pp. 32–38.

"Sewage Disposal." *Proc. Ill. Soc. Eng. and Surv.,* Vol. IV, 1889, pp. 53–59.

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Discussion in symposium on "Cost of Track Laying." *Proc. Ill. Soc. Eng. and Surv.,* Vol. IV, 1889, pp. 137–138.

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"Railway Transition Curves." *Technograph,* No. 5, 1890-1891, pp. 77–103.

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"Presidential Address 'Some Qualifications of the Engineer.'" *Proc. Ill. Soc. Eng. and Surv.,* Vol. VI, 1891, pp. 18–26.

Discussion in symposium on "Metric System." *Proc. Ill. Soc. Eng. and Surv.,* Vol. VI, 1891, pp. 138–139.

"Presidential Address 'Engineering Progress and Prospects.'" *Proc. Ill. Soc. Eng. and Surv.,* Vol. VII, 1892, pp. 15–20.

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