The ELECTRICAL ENGINEER

SOME FACTS CONCERNING ELECTRICAL ENGINEERING AS A CAREER

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THE ELECTRICAL ENGINEER

Purpose of this Booklet

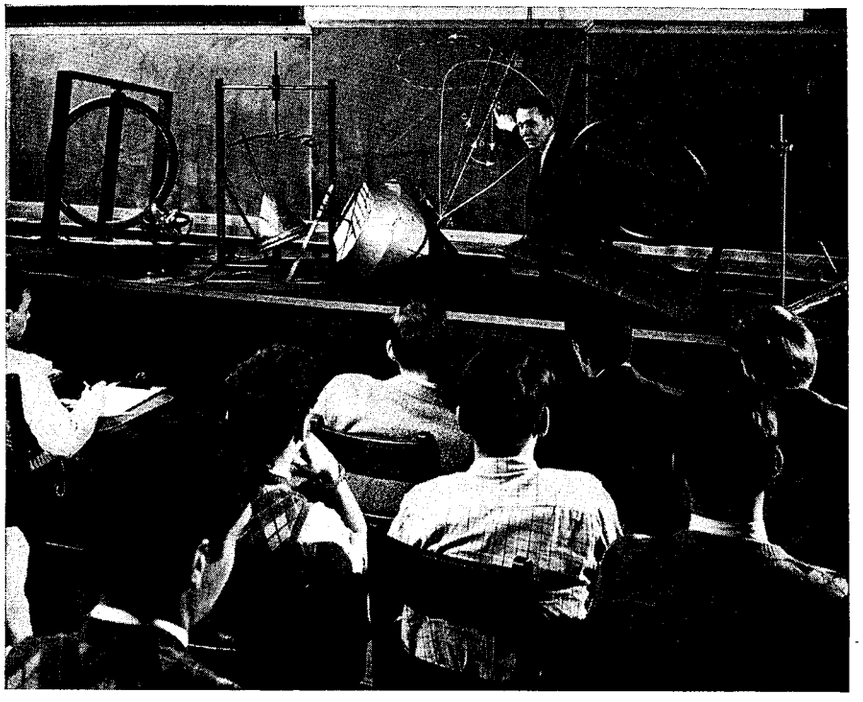
THIS BOOKLET is addressed to high school students and their advisers. In it the American Institute of Electrical Engineers presents information regarding the work done by electrical engineers, the opportunities available, the types of persons most likely to succeed, the education required, and other facts of interest. This information is designed to encourage students having the necessary abilities and preferences to decide upon electrical engineering and to secure a suitable type of education.

Before deciding to pursue an electrical engineering course, a student should determine, insofar as he can, his aptitude for engineering. He should also seek knowledge of the profession in order to evaluate his interest in one of the various branches. The following points are worthy of consideration:

1. The characteristics of engineering in general, and of electrical engineering in particular.
2. The requirements of the profession in terms of personal and educational qualifications.
3. The kinds of work done by electrical engineers and the opportunities for properly qualified men.

By studying these factors and by talking with engineers and with high school advisers, the student can weigh his interests and qualifications as he chooses his college course. In the end it is *his own* choice.

While the student who chooses his general field of life work wisely and early has an advantage, too early specialization in a particular field of engineering is not necessary, nor is it encouraged. Nor is it necessary that an electrical engineering graduate feel obliged to stay in the specific practice of the profession after graduation. The basic education in engineering is invaluable training for most positions in industry. The complexity of this machine age permits those with a basic knowledge of engineering to succeed more easily than those without such training. One also finds that electrical engineers often end up in work predominantly mechanical engineering, industrial engineering, consulting, construction, patent law, or any one of a number of related activities. Enduring success in any branch of engineering requires a thorough knowledge of the cultural and science subjects basic to all engineering education.



Theoretical discussion and demonstration of the principles of the gyroscope. The lecturer in freshman mechanics is pointing out forces which combine to set up precession.

ENGINEERING IN GENERAL

ENGINEERING is the harnessing of nature for the service of mankind. The profession offers real opportunities for talented men to create new products from which new industries may spring, to develop new tools to lessen human labor, to operate the innumerable technical services on which our civilization depends, and to manage complex enterprises.

The very bone and sinew of engineering is a respect for truth. The forces of nature are inexorable in their action, and will destroy the product of the engineer whose calculations are at fault. Hard mental and physical work is required of those who will master the scientific knowledge and gain the practical experience necessary to apply nature's forces to useful work. Satisfaction and happiness come from achievement and the conviction that the work done is of lasting benefit to others. In engineering, as in other professions, achievements follow directly from hard work and ability, and rewards are in proportion to accomplishments.

The usual preparation for an engineering career is a college course of four or five years followed by employment in some branch of the profession. Customarily, the college course is considered a prerequisite because engineering, dealing as it does with the broad aspects of human activity, must have men of correspondingly broad training. It is usually impracticable to secure this training, and particularly the scientific and technical phases of it, in any other way.

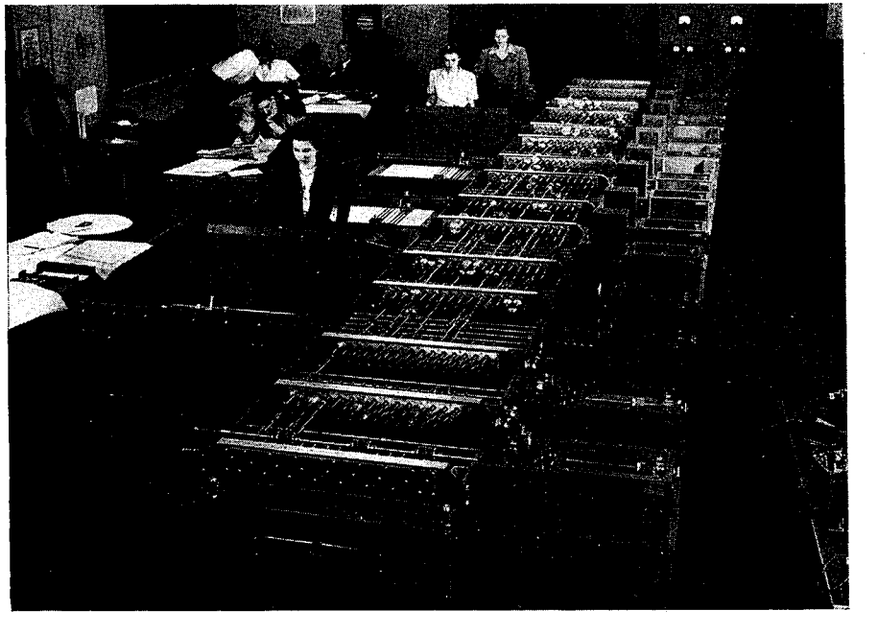
ENGINEERING—SCIENCE, MATHEMATICS, BUSINESS, HUMAN RELATIONS

PURE science, especially physics and chemistry, furnishes the fundamental data upon which the engineer bases his reasoning. Mathematics teaches him to make dependable calculations and provides a convenient language for expressing scientific and engineering ideas. Business provides the means for carrying out engineering projects and making them useful to mankind.

Technical knowledge is used to develop new products such as radios, electric lights, or other equipment, and continuously to improve the performance and lower the cost of these products.

In brief, then, engineering utilizes both science and business, but it is different from either. It differs from pure science, which seeks to know facts apart from their economic value, because it seeks to use science for material improvements and progress within the imposed limitations of materials, costs, and time. It differs from business which deals chiefly with commercial and financial problems whereas engineering deals more directly with physical materials and processes. In engineering, technical excellence rather than monetary success is of first importance.

Another feature of engineering which distinguishes it from other professions is its cooperative character. The scale of modern enterprise requires the organization of large corporations, which bring together enough men, money, and supplies



High-speed differential analyzer provides quick solution of complex mathematical problems.

to do great things. Competent engineers are organizers and directors more often than they are individual practitioners. Early in their careers they are members of a group working together rather than alone. Because of the type of work engineers do, because they are so often part of a cooperative group, knowledge of human relations, public speaking, and economics are important subjects in the student's course of study.

ELECTRICAL ENGINEERING

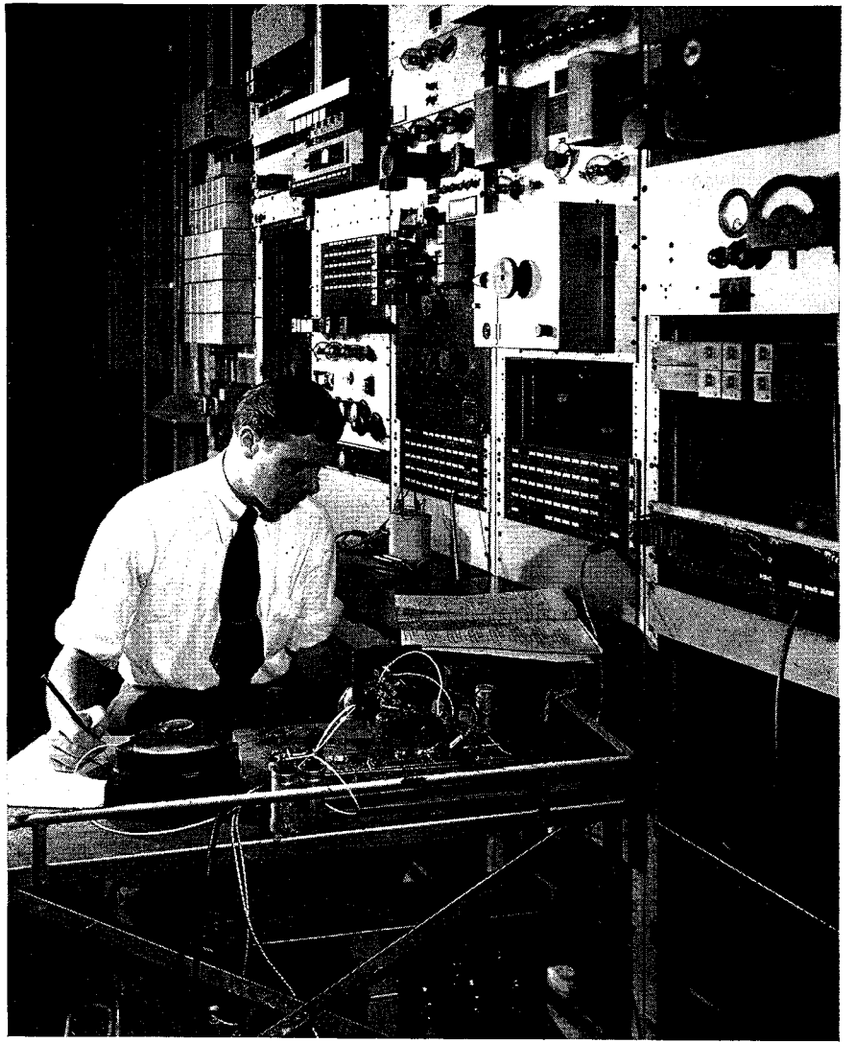
WHEN electrical engineering is mentioned, people naturally think of radios, telephones, television, electric lights, electronic devices, electric ranges and refrigerators, transmission lines, etc. These, however, are only the popular evidences of the many hours of planning and research, which comprise electrical engineering. Years of fundamental research, careful designing, and rigorous testing, are all prerequisite to the production of this equipment, the building of generating stations, power and communication systems, and the construction of electrical devices.

Unique Features

Electrical engineering deals with electricity which does not have physical form and hence cannot be handled as can the materials used by many engineers. Of all the engineering branches, it is perhaps the closest to the fields of mathematics and physics. Thus, electrical engineering should be interesting to scientifically and mathematically minded persons who have a desire to see their work produce practical results. Engineers need imagination in order to preconceive the design and assembly of apparatus or systems not yet built. Engineering education and experience on the job will provide the other essentials required for success in electrical engineering.

Universal Use of Electricity Means Many Opportunities

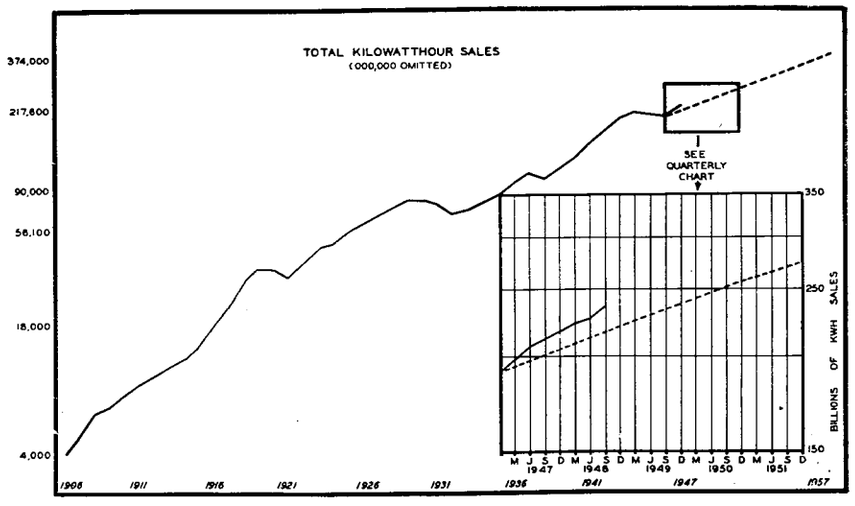
The reason for the rapid spread and wide use of electricity (and, therefore, the increasing importance of the electrical engineering profession) is its adaptability to the needs of man, in factories, homes and recreation centers. Electricity drives household appliances and factory equipment, lights homes and cities, propels trains at high speed for long distances, and carries messages and pictures around the world in less than the twinkling of an eye. The use of electricity has developed very rapidly, because, in addition to becoming the prevailing means of transmitting power generated by steam, water, internal combustion engines, and gas turbines, and replacing domestic devices such as candles, lamps, and hand labor, it has provided many new ways of rendering service to mankind. Among these are communication by radio, telephone, and television; innumerable electronic controls, electrical measurements, geo-physical exploration, and therapeutic work by X-rays.



How well you can hear over a telephone circuit depends on countless transmission tests. Here a telephone engineer is testing a toll line circuit with a newly designed variable oscillator. The bays in the rear contain telephone repeater equipment.

Rapid Growth of Industry

The phenomenal growth in annual sales of the electric power industry, from 4 billion in 1907 to 218 billion Kilowatt hours in 1947, is shown on the accompanying graph. Up to this time the greatest use has been for lighting and rotating equipment. Industrial plants for example have been using over 70% of their electrical energy for lighting and for operating motors.



TOTAL KILOWATTHOUR SALES
(000,000 OMITTED)

YEAR	RESIDENTIAL CUSTOMERS	FARM CUSTOMERS	SMALL IND'L & COMM. CUSTOMERS	LARGE IND'L & COMM. CUSTOMERS	OTHER CUSTOMERS	TOTAL
1906						4,000
1911						9,000
1916						18,000
1921						30,700
1926	6,727	726	9,485	31,993	7,169	56,100
1931	11,373	1,879	13,544	36,937	8,167	71,900
1936	14,992	2,138	15,612	48,655	8,603	90,000
1941	23,861	3,614	24,628	76,061	11,836	140,000
1946	35,723	7,278	33,016	98,885	15,898	190,800
1947	40,748	8,974	38,379	113,523	15,957	217,600
1957	81,600	21,600	58,163	194,000	18,900	374,000

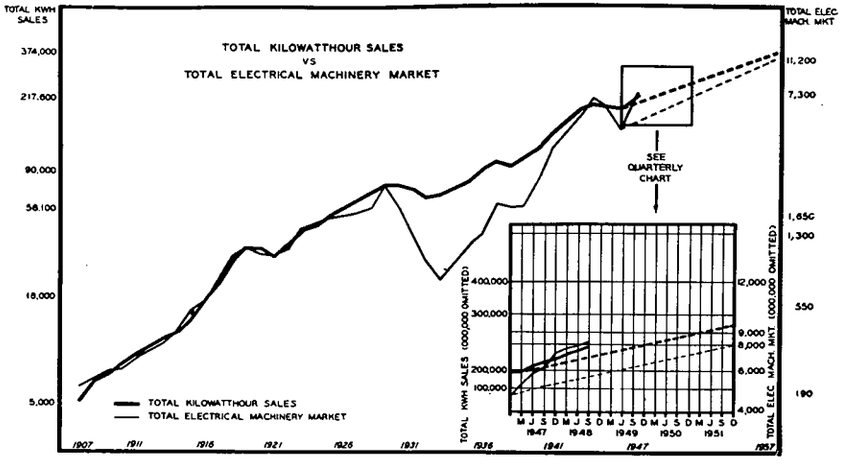
The application of electricity to industrial processing, such as continuous annealing, brazing, radio frequency heating, welding, electroplating, baking, and drying has tremendous possibilities that are now being developed. The expansion of electronic processes, such as tin reflowing, and the adoption of electricity for industrial and home heating, because of its great flexibility and control possibilities, are other examples of the type of process applications that open important new fields for the electrical engineer. Rapid developments are being made in the application of electronics to the fields of communication and control.

Leadership

The standing of a profession is largely determined by its leaders. The pages of electrical engineering history are full of the activities of outstanding men, some of whom have had their achievements described in a way that will provide the reader with inspiration, interest, and even amusement. Among those of the past are Franklin, Faraday, Edison, Heaviside, Henry, Maxwell, Pupin, Lamme, Tesla, Marconi, Bell, Elihu Thomson, Westinghouse and Steinmetz. There are others today contributing similarly to electrical engineering progress. Students contemplating the pursuit of engineering as a life's work will find inspiration in the biographies of these and other men who have contributed to the development of the profession.

OPPORTUNITIES FOR ELECTRICAL ENGINEERS

THE most important fields for electrical engineers are found in manufacturing, utility operations and teaching. Another important field involving broad engineering activities is consulting. Engineers employed in any one of these fields



YEAR	TOTAL KILOWATTHOUR SALES (000,000 OMITTED)	TOTAL ELECTRICAL MACHINERY MARKET (000,000 OMITTED)
1907	5,000	190
1911	9,000	280
1916	18,000	550
1921	30,700	1,000
1926	56,100	1,650
1931	71,900	1,190
1936	90,000	1,300
1941	140,000	3,769
1946	190,800	4,700
1947	217,600	7,300
1957	374,000	11,200

may find a major interest in research, development, design, application, sales, construction, or management.

Manufacturing

Manufacturing has been named first because it leads the other classifications in the number of engineers and the amount of capital employed. The total value of electrical products manufactured in 1947 was nearly seven and one half billion dollars, placing this industry eighth in order of financial magnitude in the United States.

The universal applicability of electricity, which makes it a part of all industry and home life, has been responsible in the United States for more than 2,200 different electrical manufacturing companies. Most of them produce only a few types of apparatus, and many are devoted to the manufacture of one product only.

Operating

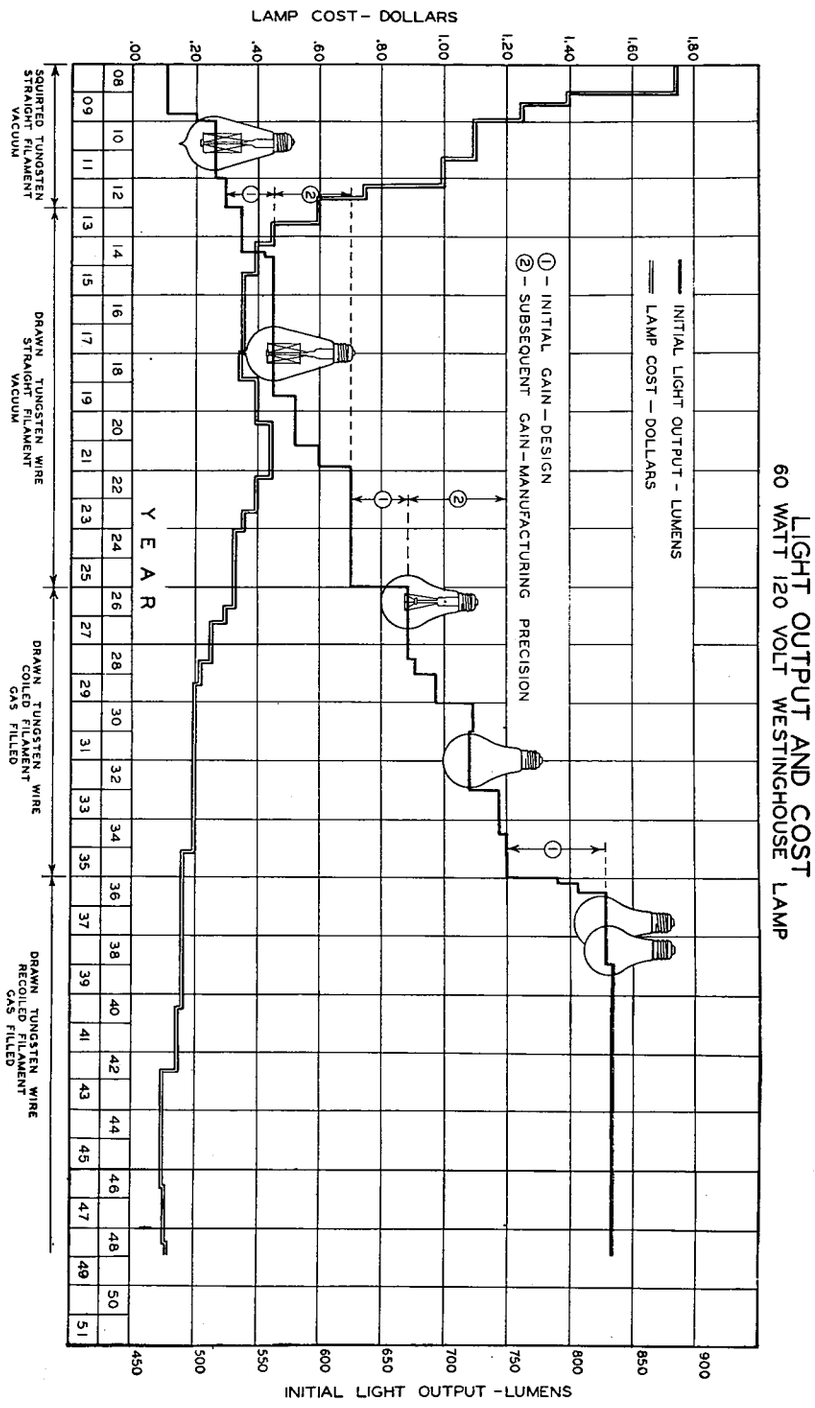
Operating refers to the work done by utility companies and similar organizations in the business of communication, generation, transmission, and distribution of electric power and transportation. It covers not only the day by day operation of the plants, but also research, design, and construction aimed toward the production and operation of assemblies of devices and materials to create a system for practical service to the public.

The essential objective is that of rendering efficient and uninterrupted service in their respective fields regardless of the troubles that may occur. At the same time, engineers are continually improving the quality of equipment and service and lowering the costs to the public.

Operating a utility system, be it power or communication, does not mean doing the same thing day in and day out, because utility engineers must be able to anticipate trouble and where possible prevent its occurrence or limit and isolate the damage by installing protective equipment. System development must be kept ahead of the demand for service with due consideration given to maximum service at minimum cost. When unexpected emergencies do occur those in charge are called upon to devise and to apply measures which will restore service in the shortest possible time. To do this work well requires courage, resourcefulness, and enterprise, as well as technical and executive ability.

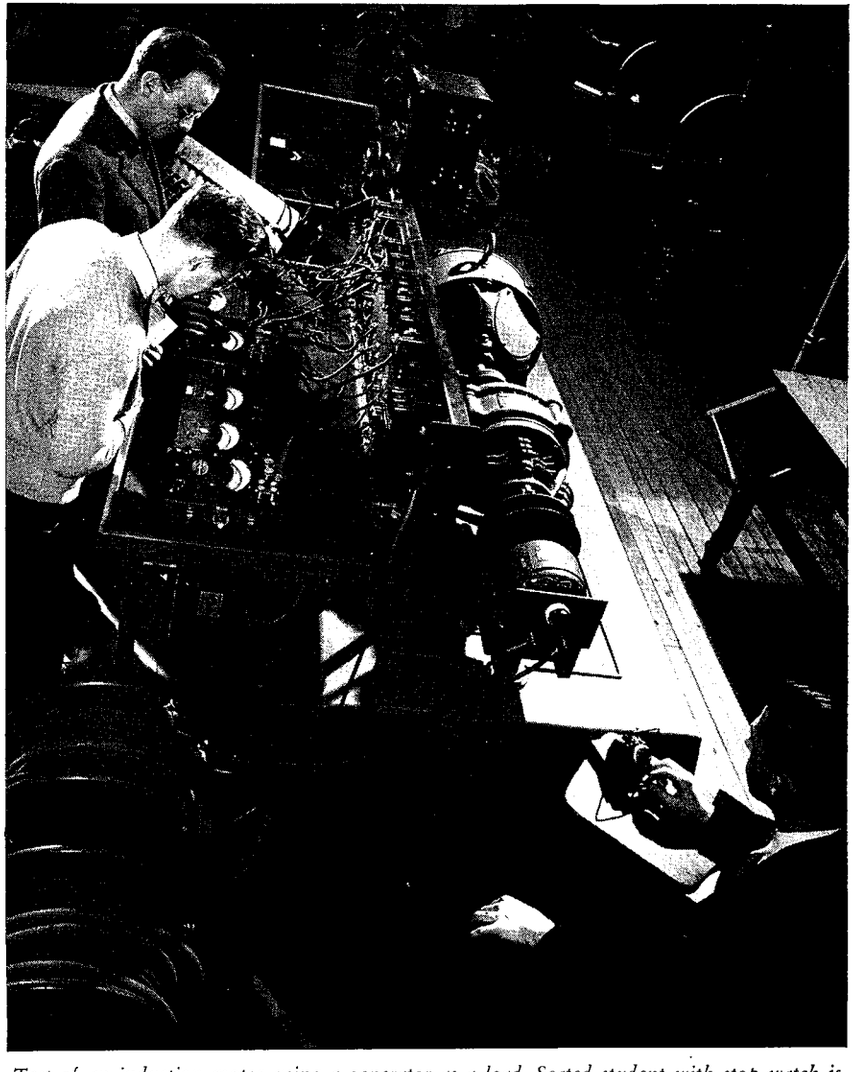
Teaching

Teaching is an essential part of the engineering profession. Basic to good engineering is an adequate and continuous supply of well-educated and carefully selected, young enginers to supplement and replace the older, experienced men now practicing that profession. The engineering colleges which provide this education must be staffed by able engineers properly trained and qualified to teach. The ability to inspire others and impart knowledge to them is not easily acquired. Success in teaching, as in other occupations, requires a considerable natural aptitude for the work. Some of the best engineering teachers are engineers, who, after



several years of practical work, have transferred to the teaching branch of their profession.

Quite apart, however, from the field of engineering teaching, there has been recently a considerable demand in colleges, junior colleges, technical institutes and high schools for graduates of engineering colleges as teachers of science, mathematics, and the mechanical arts. Vocational, as distinct from professional education, is of growing importance throughout the country, and many electrical engineering graduates are finding useful careers in this area of education.



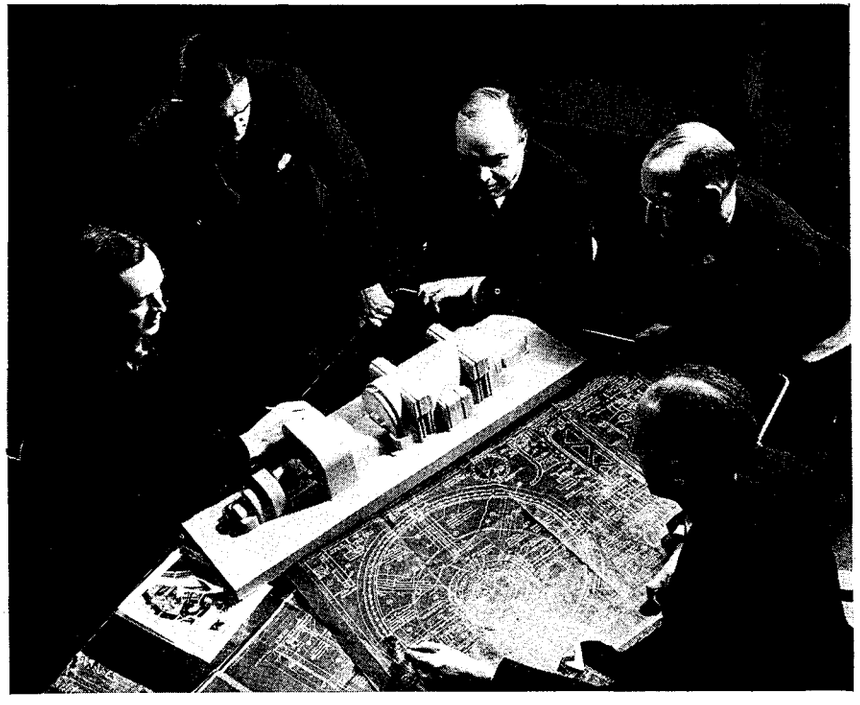
Test of an induction motor using a generator as a load. Seated student with stop watch is observing stroboscope on auxiliary single phase synchronous motor to measure the slip of the induction motor.

REPRESENTATIVE TYPES OF ENGINEERING WORK

ENGINEERING jobs are frequently classed as research, development, design, application, sales, operating, construction, and management.

Research engineers make pioneer scientific studies of theories, circuits, materials, and machines. They do so usually without particular regard for the time of delivery of a finished product or of its immediate economic value, but with an unquenchable zeal for new discoveries, better materials, and improved apparatus.

A test foreman checks an engineering graduate student in the test of a marine motor stator.



Development engineers working on a model.

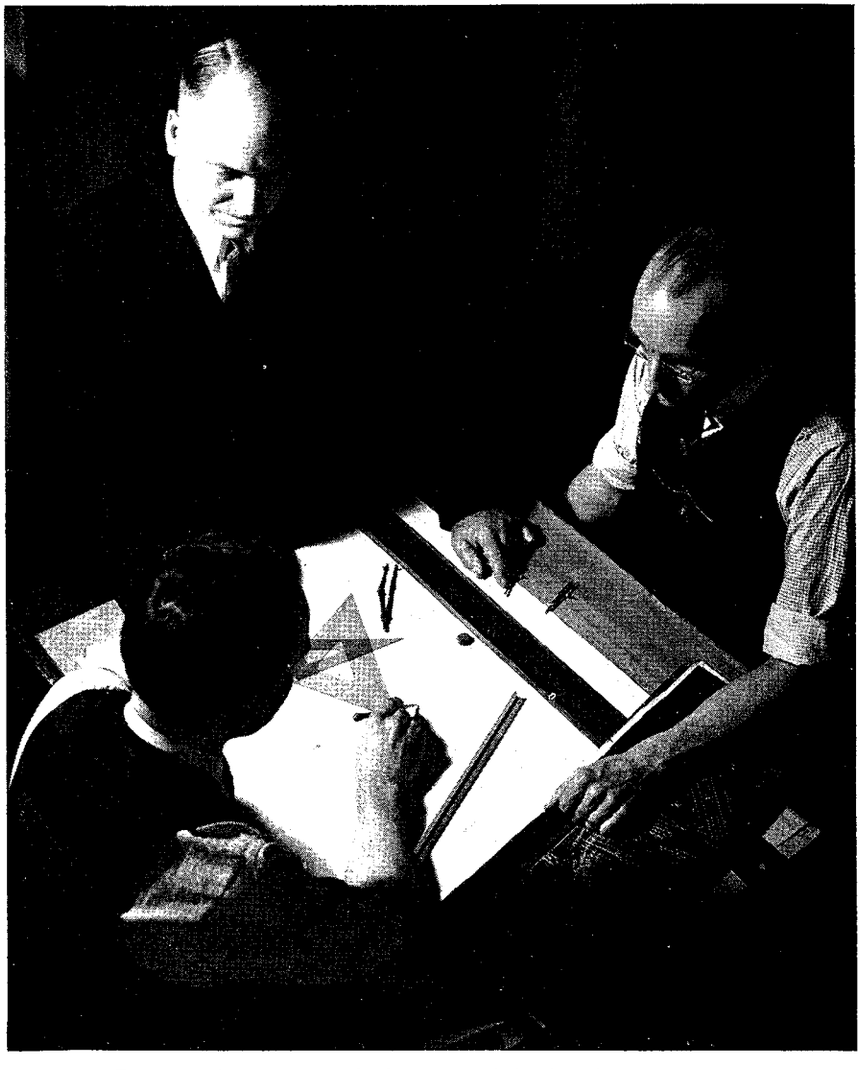
Development engineers translate into working models the ideas and analyses of research engineers. To do this work well, one must have a research attitude, mechanical ingenuity, a knowledge of material properties and factory processes, and considerable design skill.

Design engineers develop research results and working models into useful apparatus of minimum cost, consistent with the fulfillment of the users' requirements. The designer is not limited to the practice of putting "the right peg in the right hole" but is concerned with making the most out of materials and ideas available. The good designer must devise new methods and initiate new problems of research and development. Such work requires a fine combination of electrical, mechanical, thermal, metallurgical, and chemical engineering knowledge. In the electrical industry, the number of designing engineers is large and includes men with a variety of abilities and a wide range of interest.

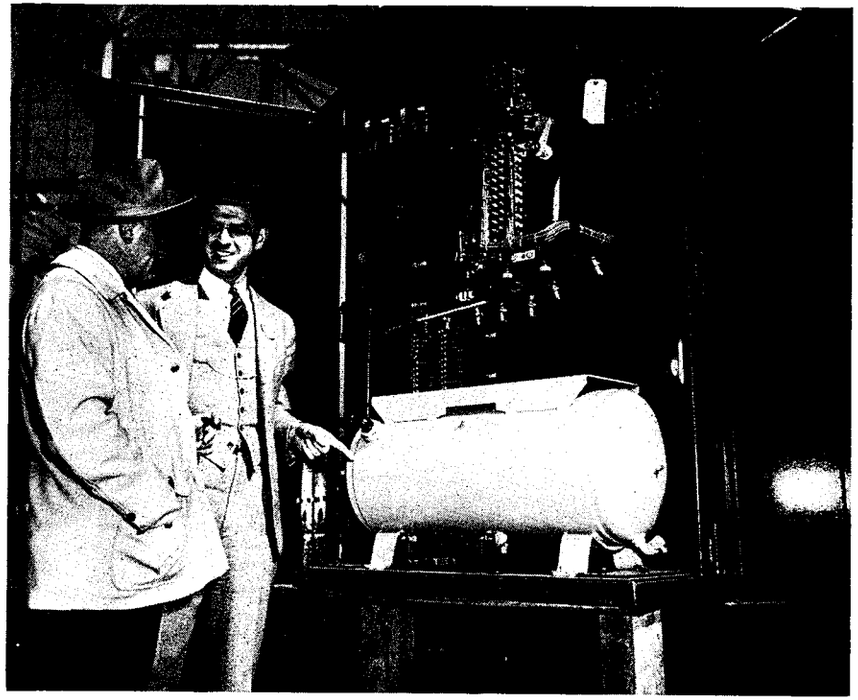
Application engineers take the products of the research, development, and design engineers and apply them to the customer's needs. This requires not only a complete knowledge of these needs and the service advantages of the product, but also the preparation of cost studies which demonstrate financial advantages. Consequently, application engineers deal not only with the technical characteristics of electrical apparatus but also with questions of investment, depreciation, and expense of operation, all of which require a fundamental knowledge of economics

and accounting. They also anticipate new requirements of industry, and specify how equipment can be put to the most effective use.

Sales engineers are the contact men between the purchaser or user of electrical goods and power and those who produce them. Electrical sales engineers must be well versed in the techniques employed in the manufacture of the goods they sell, so they can specify the correct machines for the work to be done. They also translate the technical language of the factory into terms understandable by the persons who use the apparatus but who may not be technically trained. To do this well, the



Design engineers prepare the drawings and sketches of new equipment.



The products of industry are applied to useful service by the application engineer.

engineer's technical knowledge must be supplemented by training in salesmanship, dealing with people, and expression of ideas, both orally and in writing.

Construction, installation, testing, operating, and maintenance engineers are the men who put the apparatus together and keep it in service. They must be intimately familiar with existing equipment and tools of every sort. They must understand the nature of the various troubles which may occur in electrical systems. They must always expect emergencies and have ready plans to combat them. In this field, the practical engineer excels, with a fine judgment derived from experience with men and materials.

Administration and Management

Factory and utility management requires the solution of engineering, legal, business, labor, and political problems. Management positions are often attained by engineers who have the aptitudes essential for good management and have learned the business in which they are employed.

The Technician

Consideration must be given to the technician, or electrician, as distinguished from the electrical engineer. Many a boy wants to work with his hands instead of dealing with mathematics and other highly theoretical subjects. There is need for

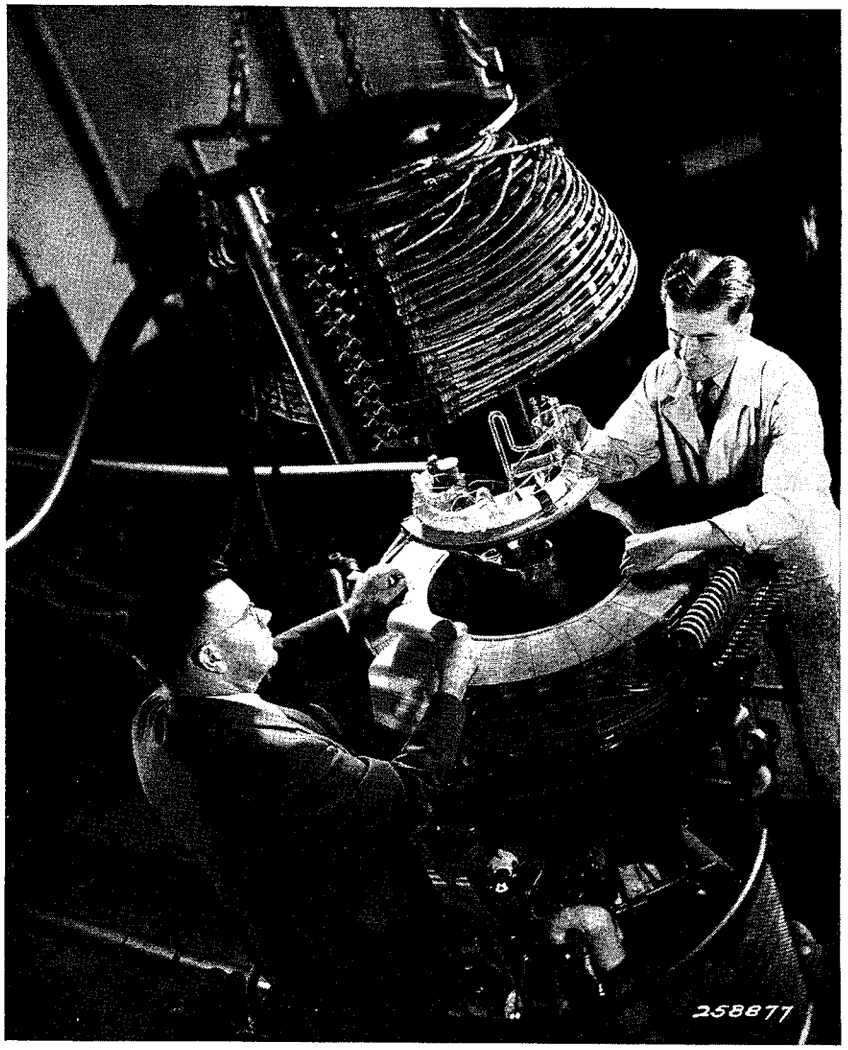
such skilled workmen in a vast number of operating, construction, installation, testing, and maintenance jobs. Somewhat different aptitudes than those of engineers are required, and the usual training is different, but the one is fully as important as the other. Excellent trade and vocational schools are available for training technicians.

QUALIFICATIONS OF THE ELECTRICAL ENGINEER

Character

The qualifications for success as an engineer include those essential to achievement in any of the other professions. They are personality, character, willingness to work, love for the problems of the profession, and a proper training in the necessary techniques. Engineering success, the foundation of which is technical skill and training, is so rarely attained by persons whose sole asset is technical brilliance that employers, requested to state the qualifications for success in engineering, consider technical training as only one among many desired characteristics. For example, application forms for positions in industry ask the references to rate the applicant not only on his technical training, but also as to integrity, dependability, determination, resourcefulness, cooperativeness, broadmindedness, and general knowledge. Thus, employers clearly indicate that they desire men with

The sales engineer is the contact man between the purchaser or user of electrical goods and power and those who produce them.



Scientists carry on nuclear research with the aid of the mass spectrometer.

CHARACTER and those other qualities which enable them to "run under their own power" as well as technical skill and education.

A survey of many industrial plants made to determine the reasons why some engineering graduates fail as engineers resulted in the practically unanimous opinion that such failures result from deficiencies in personality, ability to cooperate, general culture, tact, industry, and willingness to accept responsibility, rather than from lack of technical training.

The man with character enters a new position with the determination to make himself useful, and "carry his weight" from the first. His associates are glad to

assist in his further training in return for the services he renders them. The man who lacks initiative and who always expects others to tell him how to do his job may soon find himself regarded as a mere production unit.

Aptitudes

Probably the best single index of engineering aptitudes at high school age is a good ability in mathematics. The electrical engineer must deal so extensively with electricity which he cannot see, with circuits represented only by diagrams, and with plans for apparatus not yet built, that ability for visualizing and making

Working drawings.

drawings is essential. Mechanical skills for making models, using tools, and handling materials are also of value for the engineer. The boy who is accustomed to using his hands in metal or woodworking activities has an advantage over the student who has only textbook knowledge.

Education

Only a limited success in engineering is possible without a college education, yet an engineering degree does not guarantee success. Outstanding achievement results from study and hard work, continued as long as one is engaged in engineering practice.

The value of earnest work in college is well substantiated by statistics which show that men who succeed in the professions are usually those who maintained high scholarship as students. Most engineering colleges carefully examine an applicant's high school record before admission in order to reduce the number who fail to make the grade in college. Therefore, before entering an engineering college, one should have proved himself to be a good student in high school. Aptitudes for mathematics and science are vital; hence the student contemplating an electrical engineering career should rate well in these.

It is recommended that students who have decided to attend an engineering college, and have qualified for entrance, select a college in which the course they wish to take is accredited by the Engineers' Council for Professional Development. A list of educational institutions with curricula accrediated by E.C.P.D. was published in *Electrical Engineering*, Vol. 68, January, 1949, and is appended to this booklet. Reprints of this article and additional information may be obtained by writing E.C.P.D. headquarters, 29 West 39th St., New York 18, N. Y.

During the college training period the student should strive to achieve:

1. Ability in clear thinking, writing, and concise speech.
2. Facility with mathematics as a tool for solving engineering problems and as a language for expressing physical concepts.
3. Knowledge of the scientific fundamentals which underlie all engineering work.
4. Skill in picturing physical apparatus and understanding engineering elements and the ability to convey these pictures to others.
5. Facility in handling the equipment common to the practice of engineering.

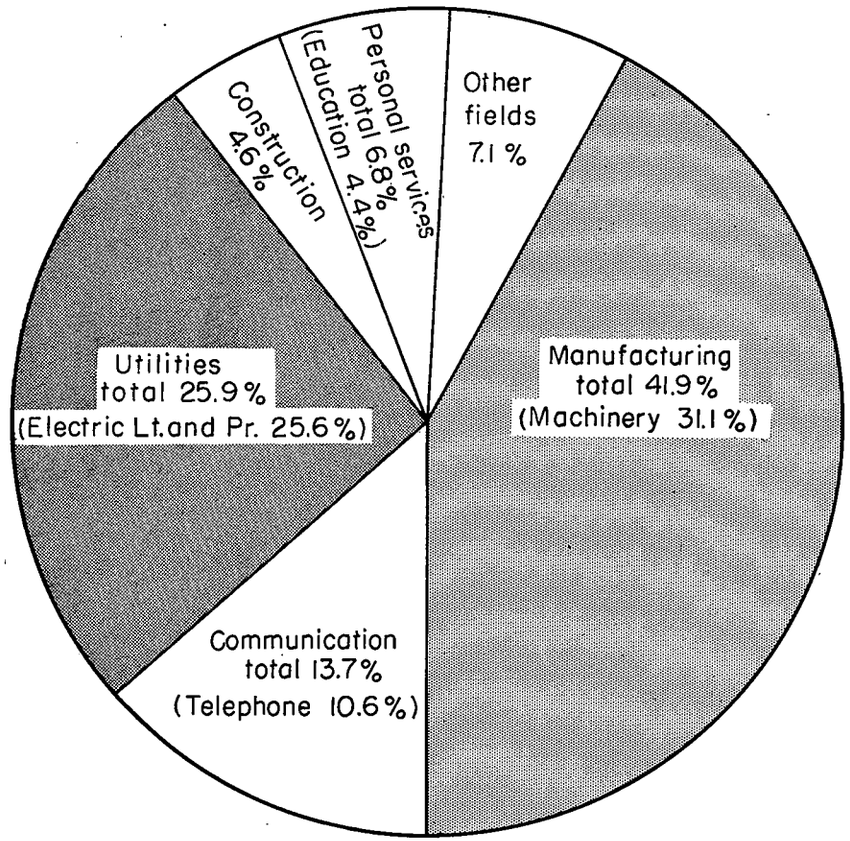
STABILITY OF EMPLOYMENT

DURING the 1929-1934 economic difficulties a maximum of 11% unemployment of all engineers was reached, the more acute cases being among men over 53 and under 27 years of age. The engineers fared better during this period than skilled mechanics and other craftsmen. Employment for newly graduated engineers has been good although it must necessarily fluctuate with business conditions.

DIVERSITY OF EMPLOYMENT

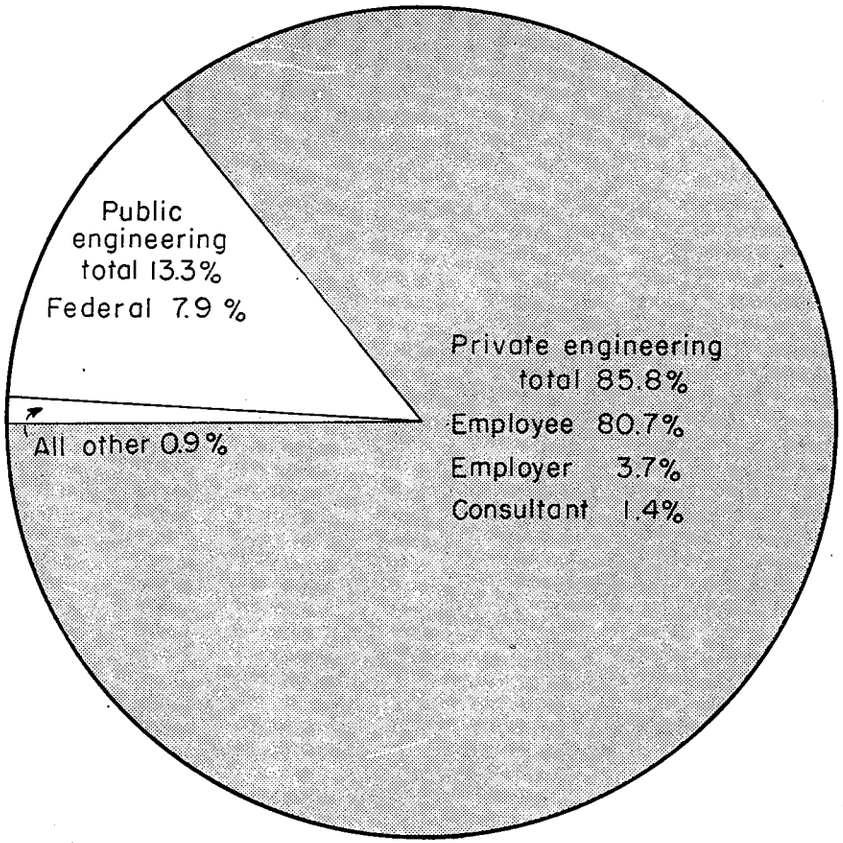
A REPORT of a joint committee of the leading engineering societies published in 1947 lists the following major industry fields in the practice of electrical engineering:

PERCENTAGE DISTRIBUTION OF ELECTRICAL ENGINEERING ACCORDING TO 1946 SURVEY BY INDUSTRY FIELD



Further information of this nature is available in a booklet entitled "The Engineering Profession in Transition" — Price $1.00, obtainable through the Engineers Joint Council, 29 West 39th St., New York 18, N. Y.

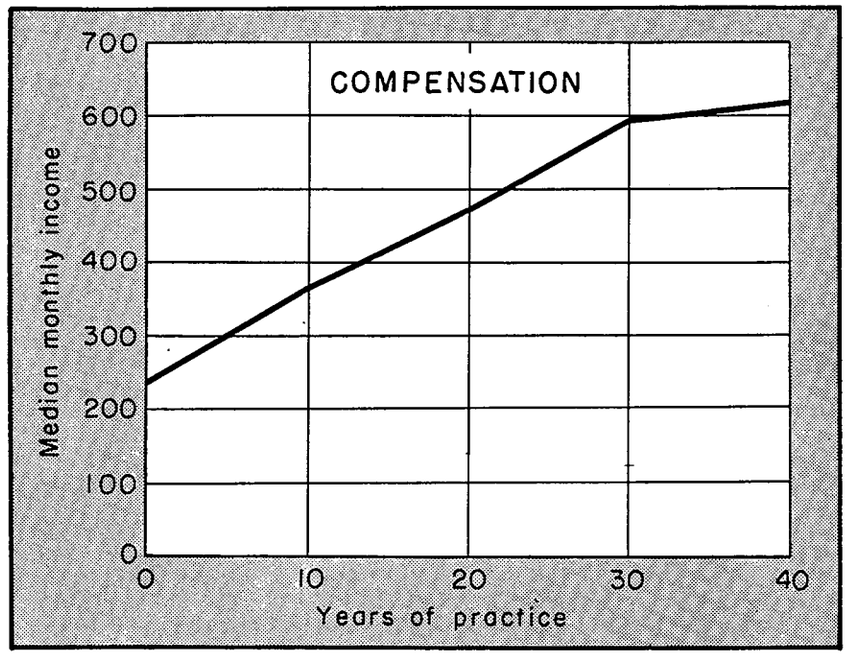
PERCENTAGE DISTRIBUTION OF ELECTRICAL ENGINEERING ACCORDING TO 1946 SURVEY BY CLASS OF WORKER



COMPENSATION

THE salaries received by electrical engineering graduates compare favorably with other professions. The following curve derived from studies of the Engineers Joint Council in 1946 illustrates range of salaries within the profession.

The salaries of the top ten percent after 25 years of practice average over $900 whereas the lower ten percent average $340 after this period. In this connection it is worthwhile to note that the earning capacity of the average engineer tends to increase until his 60th year of age and 37th year of practice. This is in keeping with other professions such as law and medicine.



ENGINEERING SOCIETIES

THE American Institute of Electrical Engineers, one of several engineering societies representing the principal branches of engineering, was organized in 1884. Its objects are the advancement of the theory and practice of electrical engineering and of the allied arts and sciences and the maintenance of a high professional standing among its members. The Institute has contributed much toward the remarkable progress in the electrical field during the past six decades and has been an important factor in advancing the interests of its members and of the entire engineering profession. The institute, a corporate organization with more than 30,000 members, conducts its activities by holding national, District, Section, and Student Branch meetings, and by the publication of technical and other papers of interest to its membership.

Through its various activities at the colleges, the Institute has for many years participated extensively in the development of electrical engineering students. The Student Branches established in 129 engineering colleges assist in helping students to learn what electrical engineering is and how electrical engineers conduct their affairs. Many of the 84 local Sections sponsor talks on the various phases of engineering at high and secondary schools. This activity brings the students into direct contact with authorities in electrical and other engineering fields. The headquarters staff, the Committee on Student Branches, and the Section officers of the American Institute of Electrical Engineers will gladly answer inquiries from high school students and others interested in this division of engineering. Such inquiries should be sent to Institute headquarters at 33 West 39th Street, New York 18, N. Y.

List of Undergraduate Engineering Curricula Accredited by ECPD as of October 29, 1948

(Subject to periodic revision)

Akron, University of: Electrical[c], mechanical (industrial and aeronautical options)[c]

Alabama Polytechnic Institute: Civil, electrical, mechanical

Alabama, University of: Aeronautical, civil, electrical, industrial, mechanical, mining

Alaska, University of: Civil, mining (including metallurgical and geological options)

Arizona, University of: Civil, electrical, mechanical, mining

Arkansas, University of: Civil, electrical, mechanical

Brooklyn, Polytechnic Institute of: Chemical (day and 8-year evening), civil[a], electrical[a], mechanical[a]

Brown University: Civil, electrical, mechanical

Bucknell University: Chemical, civil, electrical, mechanical

California Institute of Technology: Aeronautical (5- and 6-year courses), chemical (5-year course), civil, electrical, mechanical

California, University of: Civil, electrical, mechanical, metallurgical (metallurgy), mining, petroleum

Carnegie Institute of Technology: Chemical[a], civil[a], electrical[a], mechanical[a], metallurgical[a]

Case Institute of Technology: Chemical, civil, electrical, mechanical, metallurgical

Catholic University of America: Aeronautical, architectural, civil, electrical, mechanical

Cincinnati, University of: Aeronautical[c], chemical[c], civil[c], electrical[c], mechanical[c], metallurgical[c]

Citadel, The: Civil

Clarkson College of Technology: Chemical, civil, electrical, mechanical

Clemson Agricultural College: Civil, electrical, mechanical

Colorado School of Mines: Geological, metallurgical, mining, petroleum production

Colorado State College: Civil, electrical, mechanical

Colorado, University of: Aeronautical, architectural, civil, electrical, mechanical

Columbia University: Chemical[b], civil[b], electrical[b], industrial[b], mechanical[b], metallurgical[b], mining[b]

Connecticut, University of: Civil, electrical, mechanical

Cooper Union School of Engineering: Chemical[d], civil[d], electrical[d], mechanical[d]

Cornell University: Chemical, civil, electrical, industrial (administrative), mechanical

Dartmouth College: Civil

Delaware, University of: Chemical, civil, electrical, mechanical

Denver, University of: Electrical, mechanical

Detroit, University of: Aeronautical[c], architectural[c], chemical[c], civil[c], electrical[c], mechanical[c]

Drexel Institute of Technology: Civil[c-r], electrical[c-r], mechanical[c-r]

Duke University: Civil, electrical, mechanical

Fenn College: Electrical[a,c-r], mechanical[a,c-r], metallurgical[a,c-r], structural[a,c-r]

Florida, University of: Aeronautical, chemical, civil (includes public health option), electrical, industrial, mechanical

George Washington University: Civil, electrical, mechanical

Georgia Institute of Technology: Aeronautical, ceramic, chemical[c-r], civil[c-r], electrical[c-r], mechanical[c-r]

Harvard University[d]: Civil, electrical (includes communication engineering) industrial (engineering and business administration), mechanical, metallurgical (physical metallurgy), sanitary

Howard University: Civil, electrical, mechanical

Idaho, University of: Civil, electrical, mechanical, metallurgical (metallurgy), mining (includes geographical option)

Illinois Institute of Technology: Chemical, civil, electrical, mechanical

Illinois, University of: Architectural, ceramic (technical option), chemical, civil, railway civil, electrical, railway electrical, general[f], mechanical, railway mechanical, metallurgical, mining

Iowa State College: Agricultural, architectural, ceramic, chemical, civil, electrical, general[f], mechanical

Iowa, State University of: Chemical, civil, electrical, mechanical

Johns Hopkins University: Civil, electrical, mechanical

List of Undergraduate Engineering Curricula Accredited by ECPD as of October 29, 1948 (continued)

Kansas State College: Agricultural, architectural, civil, electrical, mechanical

Kansas, University of: Architectural, civil, electrical, mechanical, mining

Kentucky, University of: Civil, electrical, mechanical, metallurgical, mining

Lafayette College: Civil, electrical, industrial (administrative), mechanical, metallurgical, mining

Lehigh University: Chemical, civil, electrical, industrial, mechanical, metallurgical, mining

Louisiana Polytechnic Institute: Civil, electrical, mechanical

Louisiana State University: Chemical, civil, electrical, mechanical, petroleum

Louisville, University of: Chemical[c], civil[c], electrical[c], mechanical[c]

Maine, University of: Civil, electrical, general[f], mechanical

Manhattan College: Civil, electrical

Marquette University: Civil[c], electrical[c], mechanical[c]

Maryland, University of: Chemical, civil, electrical, mechanical

Massachusetts Institute of Technology: Aeronautical, chemical, civil (includes building and construction engineering and sanitary option), electrical[c-r], general[f], industrial (business and engineering administration), mechanical[c-r], metallurgical (metallurgy), naval architecture and marine engineering (including marine transportation)

Michigan College of Mining and Technology: Chemical, civil, electrical, mechanical, metallurgical, mining

Michigan State College: Civil, electrical, mechanical

Michigan, University of: Aeronautical, chemical, civil, electrical, engineering mechanics, mechanical, metallurgical, naval architecture and marine engineering

Minnesota, University of: Aeronautical, chemical, civil, electrical, mechanical, metallurgical, mining, petroleum

Mississippi State College: Civil, electrical, mechanical

Missouri School of Mines and Metallurgy: Ceramic, civil, electrical, metallurgical, mining (mine) (including petroleum option)

Missouri, University of: Chemical, civil, electrical, mechanical

Montana School of Mines: Geological, metallurgical, mining

Montana State College: Chemical, civil, electrical, mechanical

Nebraska, University of: Agricultural, architectural, civil, electrical, mechanical

Nevada, University of: Electrical, mechanical, mining

New Hampshire, University of: Civil, electrical, mechanical

New Mexico College of Agricultural and Mechanic Arts: Civil, electrical, mechanical

New Mexico School of Mines: Geological, mining, petroleum

New Mexico, University of: Civil, electrical, mechanical

New York, College of the City of: Civil[a], electrical[a], mechanical[a]

New York State College of Ceramics (at Alfred University): Ceramic

New York University: Aeronautical, chemical (day and 7-year evening), civil[a], electrical[a], industrial (administrative), mechanical[a]

Newark College of Engineering: Civil[c-r], electrical[c-r], mechanical[c-r]

North Carolina State College: Ceramic, chemical, civil, electrical, industrial, mechanical (includes aeronautical option)

North Dakota Agricultural College: Architectural, civil, electrical, mechanical

North Dakota, University of: Civil, electrical, mechanical, mining

Northeastern University: Chemical[c], civil[c], electrical[c], industrial[c], mechanical[c]

Northwestern University: Chemical, civil, electrical, mechanical

Norwich University: Civil, electrical

Notre Dame, University of: Aeronautical, civil, electrical, mechanical, metallurgical (metallurgy)

Ohio State University: Ceramic, chemical, civil, electrical, industrial, mechanical, metallurgical, mining (mine)

Oklahoma Agricultural and Mechanical College: Civil, electrical, industrial, mechanical

Oklahoma, University of: Architectural, chemical, civil, electrical, mechanical, petroleum

Oregon State College: Chemical, civil, electrical, mechanical

List of Undergraduate Engineering Curricula Accredited by ECPD as of October 29, 1948 (continued)

Pennsylvania State College: Architectural, ceramic (ceramics), chemical, civil, electrical, fuel technology, industrial, mechanical, metallurgical (metallurgy), mining, petroleum and natural gas, sanitary

Pennsylvania, University of: Chemical, civil, electrical, mechanical

Pittsburgh, University of: Chemical, civil, electrical, industrial, mechanical, metallurgical, mining, petroleum

Pratt Institute: Electrical, mechanical

Princeton University: Chemical, civil, electrical, mechanical

Purdue University: Aeronautical, chemical, civil, electrical, mechanical, metallurgical

Rensselaer Polytechnic Institute: Aeronautical, chemical, civil, electrical, industrial, mechanical, metallurgical

Rhode Island State College: Civil, electrical, mechanical

Rice Institute: Chemical, civil, electrical, mechanical

Rochester, University of: Chemical, mechanical

Rose Polytechnic Institute: Civil, electrical, mechanical

Rutgers University: Civil, electrical, mechanical, sanitary

Santa Clara, University of: Civil, electrical, mechanical

South Carolina, University of: Civil, electrical, mechanical

South Dakota State College: Civil, electrical, mechanical

South Dakota School of Mines: Civil, electrical, general[f], metallurgical, mining

Southern California, University of: Civil, electrical, mechanical, petroleum

Southern Methodist University: Civil[c], electrical[c], mechanical[c]

Stanford University: Civil, electrical, mechanical, metallurgical, mining, petroleum

Stevens Institute of Technology: General[f]

Swarthmore College: Civil, electrical, mechanical

Syracuse University: Chemical, civil, electrical, industrial (administrative), mechanical

Tennessee, University of: Chemical[c-r], civil[c-r], electrical[c-r], mechanical[c-r]

Texas, Agricultural and Mechanical College of: Aeronautical, chemical, civil (including municipal and sanitary option), electrical, mechanical, petroleum (4- and 5-year courses)

Texas College of Mines and Metallurgy: Mining (mining option, mining geology, metallurgy option)

Texas Technological College: Civil, electrical, mechanical

Texas, University of: Aeronautical, architectural, chemical, ceramic, civil, electrical, mechanical, petroleum (petroleum production)

Toledo, University of: General[f]

Tufts College: Civil, electrical, mechanical

Tulane University of Louisiana: Civil, electrical,* mechanical

Tulsa, University of: Petroleum (including options in refining and production)[c-r]

Union College: Civil, electrical

United States Coast Guard Academy: General[f]

Utah State Agricultural College: Civil

Utah, University of: Civil, electrical, mechanical, metallurgical, mining

Vanderbilt University: Civil, electrical, mechanical

Vermont, University of: Civil, electrical, mechanical

Villanova College: Civil, electrical, mechanical

Virginia Military Institute: Civil, electrical

Virginia Polytechnic Institute: Aeronautical, architectural, ceramic, chemical, civil (including sanitary option), electrical, industrial, mechanical, metallurgical, mining

Virginia, University of: Chemical, civil, electrical, mechanical

Washington, State College of: Architectural, civil, electrical, mechanical, metallurgical, mining

Washington University: Architectural, chemical, civil (including construction option), electrical, geological, industrial (administrative), mechanical

Washington, University of: Aeronautical, ceramic, chemical, civil, electrical, mechanical, metallurgical, mining

Wayne University: Civil, electrical, mechanical

Webb Institute of Naval Architecture: Naval architecture and marine engineering

West Virginia University: Chemical, civil, electrical, mechanical, mining

Wisconsin, University of: Chemical, civil, electrical, mechanical, metallurgical, mining

Worcester Polytechnic Institute: Chemical, civil, electrical, mechanical

Wyoming, University of: Civil, electrical, mechanical

Yale University: Chemical, civil, electrical, mechanical, metallurgical (metallurgy)

List of Undergraduate Engineering Curricula Accredited by ECPD as of October 29, 1948 (continued)

Explanatory Notes

* Due to the effects of the war upon education in chemical engineering, all accrediting of chemical engineering curricula ceased with the 1943 list until resumption of the inspection program in 1947-48. The accredited list shown here includes chemical engineering curricula: those on the 1943 list and also those reinspected during 1947-48 and approved by the American Institute of Chemical Engineers.

(a). Accrediting applies to the day and evening curricula.

(b). Accrediting applies to the 4-year and 5-year curricula leading to the bachelor of science degree.

(c). Accrediting applies to the co-operative curriculum only.

(c-r). Accrediting applies to both the co-operative and regular curricula.

(d). Accrediting applies to day and to 6-year evening curricula in the Cooper Union School of Engineering as submitted to ECPD.

(e). Accrediting applies only to curriculum as submitted to ECPD and upon completion of which a certificate is issued by Harvard University certifying that the student has pursued such a curriculum.

(f). The accrediting of a curriculum in general engineering implies satisfactory training in engineering sciences and in the basic subjects pertaining to several fields of engineering; it does not imply the accrediting, as separate curricula, of those component portions of the curriculum such as civil, mechanical, or electrical engineering that usually are offered as complete professional curricula leading to degrees in these particular fields.

List of Accredited Curricula of Technical Institute Type

Academy of Aeronautics (LaGuardia Field, N. Y.): Aircraft design and construction (resident full-time programs and resident part-time evening programs), aircraft mechanics and maintenance (resident full-time and resident part-time evening programs)

The Aeronautical University (Chicago, Ill.): Aeronautical engineering drafting

Bliss Electrical School (Washington, D. C.): Fundamentals of industrial electrical engineering

Bridgeport Engineering Institute (Bridgeport, Conn.): Mechanical engineering,* electrical engineering*

Capitol Radio Engineering Institute (Washington, D. C.): Residence course in practical radio engineering, correspondence course in practical radio engineering

Franklin Technical Institute (Boston, Mass.): Industrial electricity, industrial chemistry

Franklin University (Columbus, Ohio): Radio-electronics-television, refrigeration-air conditioning

Milwaukee School of Engineering (Milwaukee, Wis.): Electrotechnician, electronics technician, radio technician

Northrup Aeronautical Institute (Hawthorne, Calif.): Aeronautical engineering*

Ohio Mechanics Institute (Cincinnati, Ohio): Industrial engineering*

R. C. A. Institutes (New York, N. Y.): Advanced technology course (radio communication and sound and television)

Wentworth Institute (Boston, Mass.): Machine construction and tool design, steam and Diesel engineering, architectural construction, electrical construction

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*It should be noted that titles of curricula offered by technical institutes are sometimes the same as the titles commonly used to designate professional curricula given by degree-granting engineering colleges, although the purpose and scope of the two types of program are not the same. The curriculum listed herein has been accredited as a program of technical institute type.

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