THE BRIDGE of Eta Kappa Nu

Volume XXIII Number 1

For November, 1926

Seventy-five Books Which Every Engineer Should Know

Installation of Chi Chapter

The Future In the Public Utility Field for College Men

Michael Faraday—Philosopher

Engineering Education—Its History and Prospects

Volume XXIII

Number 1

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OF
Eta Kappa Nu

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Table of Contents

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AEROPLANE VIEW OF CAMPUS

Seventy-five Books Which Every Engineer Should Know

By *Royal J. Davis*

New York Evening Post

INEVITABLY any comprehensive list of worth-while books is composed for the most part of volumes which have long been beyond the reach of the copyright laws, or which were written before copyright was dreamed of. They are the true best-sellers, for they have been in demand during a period running for some of them into millenniums. Naturally they bear the color of the time in which they were written. They abound in references which range from what is to us merely out of date to the archaic. But any one who has not read these volumes will continually be surprised and delighted at their essential modernity. Obsolete as their framework may be, naive as many of their conceptions may seem, they are unmistakably the voices of men and women so gifted that being dead they yet speak.

Nothing can take the place of contemporary literature. Socrates is no substitute for to-day's newspaper, or to-night's play. The danger, however, is that we should think to-day's newspaper or to-night's play a substitute for Socrates. The well-read man will demand both. He will see no reason why familiarity with the one should deprive him of acquaintance with the other. Nor will he be willing to allow scholars a monopoly of the treasures of the past. A scholar will be able to appreciate certain points about these masterpieces better than a layman, but many a scholar becomes bogged in the mass of his learning and flounders in a vast knowledge of sources and parallels until he loses sight of the book itself.

The layman's ignorance of such matters is not altogether a disadvantage. Yet he too must in many cases have some notion of background. This applies in much greater measure to certain books than to others. Dante requires it far more than Horace. It is true also that some books which have been called forth by particular circumstances may be understood and enjoyed without a knowledge of those circumstances. Such knowledge, however, adds materially to the benefit to be derived from their reading. "Utopia" is an outstanding example of books of this kind. All that the layman need do in order to supply himself with this information and thus fit himself to get the most out of the book is to obtain an edition with a proper introduction. He may then, if he will exercise his imagination a little, settle himself to the satisfaction of the perusal almost as if he had lived contemporaneously with the writer and were reading the book on its first appearance.

Heaviness, solidity, solemnity—these are the qualities which most persons would ascribe to any volumes written prior to our own generation—or perhaps to any with a publication date more than ten years old. Such persons would be astonished at the sprightliness and the humor of books and plays which were composed ages before there was any such thing as type. Some of these can be understood only by means of a knowledge of events of the time, but others are as intelligible, as interesting, as amusing as if written yesterday.

The seventy-five books which are listed herewith are supposed to have been selected as being productions with which engineers ought to have an acquaintance—not particularly as engineers, however, but simply as educated men. No attempt has been made, therefore, to choose books of professional importance. The list is one which, if useful at all, would be as useful to a member of one profession as another. A professional man necessarily reads a great many books relating to his profession. Hardly anybody reads nearly as much as he ought in fields outside of his daily occupation. A little current fiction—or a good deal—and other equally ephemeral and shallow productions suffice for most of us. It is decidedly creditable to any group of men, and especially to a group of busy men, that they should desire to bring themselves into contact with the great personalities that have shed lustre on the human race.

A practical difficulty in the formation of such a list as is here presented is that of saying just what is a book. Franklin's "Autobiography" offers no such difficulty, but the poets and the playwrights raise the problem sharply. Few of them are worth entire. And even some of those that are raise the question. Is "Hamlet" a book or should Shakespeare's complete works be so considered? The list as it appears shows how the question has been answered in the present instance.

Another point to be considered is that some books, although extremely valuable in parts, are in other parts valueless for the ordinary reader. Of such books the Bible is a notable example. For most readers nothing except the satisfaction of curiosity is to be gained by the genealogical tables or the religious ritual covering page after page in Leviticus and Numbers. Accordingly, specific parts of this particular book have been indicated. Nor does the omission of such reference to specific parts of other books necessarily imply that they should be read from cover to cover. The interested

and intelligent reader is his own best judge of when to read every word and when to do some judicious skipping. There are parts of every immortal volume which everybody ought to read. Of the other parts one reader will find benefit in pages by which another reader, equally interested and intelligent, will be bored. What is to be avoided is mechanical reading. Better one page read with zest or at least alertness than a whole volume perused dully.

This, of course, does not mean that one should read a great book for mere entertainment, picking out the lighter or sprightlier parts of the volume and promptly abandoning a passage which proves to be more serious. There are plenty of books written to entertain and they have their place, but that place is not among the world's masterpieces. A great book must be read somewhat in the spirit of the person who wrote it. Such a book demands the attention due to its unusual qualities. But when a reader has sincerely endeavored to understand and appreciate a page in a volume of this kind and finds it remaining obscure or in some other way beyond him, then he should go on to what for him are more fruitful pages. This kind of skipping is not only not blameworthy; it is necessary if one is to get within a reasonable time what that particular book has to give him. A second reading some time—perhaps years later—may reward the effort by revealing cases which at the first reading had seemed utterly barren.

The notion that all books are alike in that they should be read once and then discarded as if they were so many closed accounts is comic. The joke about not giving a book as a birthday present because the prospective recipient "has a book" is no more absurd than the idea that one should never open a certain volume because he has already read it once. Few persons may care to read many books from cover to cover a second time, but anybody who has an appreciation of books will desire to read favorite passages times without number. There are not many readers who would be willing to follow the example of a certain intellectual woman who, when she had read a book which she considered valuable, immediately read it through a second time. Nevertheless, it is not a bad practice.

The list of seventy-five books as arranged here follows no special order, except for a grouping of similar volumes into classes such as poetry, essays and so on. These classes might have been arranged in any other order without affecting the significance—if any—of the list. There is no attempt to grade the volumes according to quality. Within each group the writers are listed in a more or less chronological order, but this is not true of the list as a whole. A good exercise would be to arrange these books in order of writing or publication irrespective of their subject-matter. This cannot be done with perfect accuracy, since some of them are collections of writings ranging over a considerable period. Either these might be omitted or the writers, which are included in them arranged in their proper places among the rest.

In what order should the books in such a list be read? Something is to be said for the chronological order; something for the order of association, by which books of the same kind are read during the same period. But there is another order which may be better. That is the order of interest. Let the reader choose a book he has always intended to read or one which appeals to his curiosity or one which is being discussed. Let him follow this book with another selected on the same principle or with one suggested by the volume he has just finished. If at any time he is really at a loss for a choice, let him take one at random and enjoy the piquancy of discovering what kind of prize he has drawn. The real difficulty may turn out to be to decide which of several attractive candidates to accept first.

Some of the selections of any such list as this are almost sure to be arbitrary. It may happen that the selector's likings are of a sort to enable him to choose one novel by Dickens, for example, or one play by Moliere, but this proceeding will be exceptional. Most persons who attempt to compile a list of more than a very few books will be compelled to make an arbitrary choice among several of the works of a prolific author. The alternative would be to include a number of those works, and to follow this course would either run the list beyond its assigned limits or render it badly balanced. The conscientious selector will include in his assemblage of volumes some that he may not himself relish. Recognizing his own limitations, he will do what he can to prevent anybody else from being victim to them. Perfect objectivity is as rare as any other kind of perfection; one can only hope that he has cleared away the worst of the mist of personal likes and dislikes that to some extent clouds everybody's vision.

The first three titles on the present list form a somewhat miscellaneous group, but they could not be scattered among the rest to any advantage. The one that leads the seventy-five, the historic "Apology" of Socrates, needs no apology for its occupancy of the initial position. After 2300 years this famous utterance keeps its virile freshness. One can almost see the suspicious jurymen who held within their hands the fate of the gaunt thinker and fighter who had so stirred things up in the cultural centre of the world and one can almost hear him as he makes his courageous defence of intellectual freedom, letting fly now and then an arrow tipped with the irony which was apt to irritate some of those who heard him while it gave others the keenest

1. Socrates: Apology; Phaedo; Crito.
2. Plato: Republic.
3. The Bible: Genesis; Exodus; Joshua; Judges; Ruth; I Samuel; II Samuel; I Kings; II Kings; Ezra; Esther; Job; Psalms; Proverbs; Ecclesiastes; Isaiah; Ezekiel; Daniel; Jonah; Luke; John; Acts of the Apostles; Revelation.
4. Plutarch: Parallel Lives of Famous Greeks and Romans.
5. Benvenuto Cellini: Life.
6. Samuel Pepys: Diary.
7. Saint-Simon: Memoirs.
8. James Boswell: The Life of Samuel Johnson, LL. D.
9. J. Holland Rose: The Life of Napoleon I.
10. Edward Gibbon: Memoirs of My Life and Writings.
11. J. G. Lockhart: Memoirs of the Life of Sir Walter Scott (parts).
12. John Stuart Mill: Autobiography.
13. Arthur Irwin Dasent: John Thadeus Delane.
14. Benjamin Franklin: Autobiography.
15. Paul Leicester Ford: The True George Washington.
16. Lord Charnwood: Abraham Lincoln.
17. Booker T. Washington: Up From Slavery.
18. Henry Adams: The Education of Henry Adams.
19. Pliny: Letters.
20. W. E. H. Lecky: History of European Morals.
21. Lord Acton: The Study of History.
22. Samuel Hickling Prescott: The Conquest of Mexico.
23. Francis Parkman: Pioneers of France in the New World.
24. Mark Twain (S. L. Clemens): Life on the Mississippi.
25. E. R. A. Seligman: The Economic Interpretation of History.
26. Aristotle: Politics.
27. Sir Thomas More: Utopia.
28. Anatole France: Penguin Island.
29. Walter Bagehot: Physics and Politics.
30. Woodrow Wilson: The State.
31. James Bryce: The American Commonwealth.
32. Orations: Demosthenes, On the Crown; Cicero, First Oration Against Cataline; Burke, Two Orations on Conciliation with America; Webster, Reply to Hayne; Lincoln, Gettysburg Address, The Second Inaugural.
33. The Lincoln-Douglas Debates.
34. Adam Smith: The Wealth of Nations (parts).
35. Homer: Odyssey.
36. Beowulf.
37. Horace.
38. Dante: The Divine Comedy.
39. Chaucer: Canterbury Tales — Prologue; The Knight's Tale.
40. John Milton: Minor poems; Paradise Lost, Books I-III.
41. British poets: Selections.
42. American poets: Selections.
43. Sophocles: Oedipus Tyrannus.
44. Aristophanes: The Frogs.
45. William Shakespeare: The Merchant of Venice; The Tempest; Macbeth; Hamlet; King Lear.
46. Moliére (Jean Baptiste Poquelin): Le médecin malgré lui.
47. Jean Baptiste Racine: Phédre.
48. Johann Wolfgang von Goethe: Faust.
49. Marcus Aurelius: Meditations.
50. Francis Bacon: Essays.
51. Joseph Addison: Essays.
52. Michel Eyquem de Montaigne: Essays.
53. Washington Irving: The Sketch Book.
54. Ralph Waldo Emerson: Essays.
55. Charles Lamb: Essays.
56. Thomas Babington Macaulay: Essays.
57. John Ruskin: The Stones of Venice.
58. Matthew Arnold: Culture and Anarchy.
59. Marco Polo: Travels.
60. Arthur Young: Travels in France.
61. George Borrow: Lavengro.
62. Charles Darwin: The Voyage of the Beagle (parts).
63. Miguel de Cervantes Saavedra: Don Quixote.
64. Leo Tolstoy: Anna Karénina.
65. Voltaire (Francois Marie Arouet): Candide.
66. Victor Hugo: Les Misérables.
67. Jonathan Swift: Gulliver's Travels.
68. Sir Walter Scott: Quentin Durward.
69. Charles Dickens: David Copperfield.
70. William Makepeace Thackeray: Henry Esmond.
71. Robert Louis Stevenson: Dr. Jekyll and Mr. Hyde.
72. Rudyard Kipling: Kim.
73. Nathaniel Hawthorne: The Scarlet Letter.
74. Harriet Beecher Stowe: Uncle Tom's Cabin.
75. Lew Wallace: Ben Hur.

delight. Socrates cannot be called an author. His words have come down to us in the literary productions of his renowned disciple, Plato, but no harm will be done by using his name as that of the author of the "Apology" in the form in which we have it. Along with the "Apology" may be placed the dialogues in which Socrates figures, of which two have been chosen for this list, the "Phaedo" and the "Crito." Where Socrates leaves off and Plato begins is often a mystery in other parts of Plato's work, but in the dialogues we seem to hear the older man's authentic voice. In them we follow with the pleasure of the mere listener the course of a discussion leading inevitably to the "Yes, Socrates," and the "That is most certain, Socrates," which mark the stages in the triumph of the philosopher's reasoning. The Socratic method of question and answer looks easy in the hands of Socrates, but the would-be imitator who tries it is pretty sure to make the painful discovery that he is at a loss for the proper questions to ask and that those at whom he directs his interrogatories are so unmannerly as not to return the replies he expects.

Plato in his own right may well be put next to his master with his thought-provoking "Republic," although here again it is the conceptions of Socrates that underlie the Platonic presentation. Some of the specific proposals in the "Republic" strike a modern reader as fantastic, but there is nothing fantastic about the fundamental considerations which are advanced and developed. Contemporary government of the most enlightened nations would give Plato a good many openings for embarrassing questions. The last of this group of three volumes is the Bible, which is rather a collection of books than a single book and which has its full share of uninspiring passages. A thorough appreciation of English literature without a fairly intimate knowledge of certain parts of the Bible is impossible; thus there is a special reason for familiarity with many of its pages. Despite the dreary sections to be encountered, the reader who gives himself what in these days is the comparatively novel experience of going through the volume from cover to cover will probably feel repaid for the effort. Any one who shrinks from this apparently formidable undertaking may find it interesting to read in the Old Testament, the books of Genesis, Exodus, Joshua, Judges, Ruth, Samuel (First and Second), Kings (First and Second), Ezra, Esther, Job, Psalms, Proverbs, Ecclesiastes, Isaiah, Ezekiel, Daniel, Jonah and one or more of the other "minor prophets." In the New Testament he may regard as a minimum the books of Luke, John, Acts of the Apostles and Revelation.

Biography, with autobiography and reminiscences, is bound to have a large place in any list of worth-while books. At the top naturally comes Plutarch, whose "Lives" have long been recognized as classic. The reader who does not care to see what the ancient biographer had to say about all those whose characters he drew may as well make his own selections. He will want to read the account of Julius Caesar, partly because Shakespeare got his picture of the Roman from North's translation of a French version of the Greek. Demosthenes and Cicero will be likely to attract his attention also. By the time he has read this much he will want to go on and gain a view of other notables through the eyes of their—in some instances—more notable observer. The autobiography of Benvenuto Cellini has proved a fascinating surprise to a constant succession of readers each of whom opened its pages more or less perfunctorily upon the enthusiastic recommendation of a friend, only to lose himself so completely in its story of mediaeval art, politics and society as to sit up far beyond his usual bed-time. The diary of Samuel Pepys, unique among records of self-revelation, gives a picture of private and official life in the England of the time of Charles II which is one of the prime sources of historical information. Few narratives are more interesting than its story of the great fire of 1666, which begins with a reference to a report of a blaze in a certain quarter of London and day by day thereafter relates the progress of what was soon realized to be an uncontrollable conflagration. A little later a Frenchman, Saint-Simon, was writing his memoirs of the court of the Grand Monarch, Louis XIV, and the early years of his successor. Volumes like these will whet the appetite for books written by eye-witnesses of historical events, especially eye-witnesses who were also participants in some measure in the colorful incidents which they make live again in their pages. French historical writing is especially rich in this kind of moving-picture.

Boswell's "Life of Samuel Johnson" remains the outstanding example of vivid, comprehensive biography, unapproached and perhaps unapproachable. The incidental light it throws upon the personality of Boswell has been the theme of controversy among critics, of which the clash between Macaulay and Carlyle is the most conspicuous instance, but most readers will care less for this aspect of the remarkable work than for its more obvious appeal as a record of one of the most forceful, not to say violent, figures that have ever dominated a group of human beings. Napoleon had no Boswell in the army of biographers who have endeavored to tell the tale of his amazing achievements and to analyze his genius and his personality, but the "Life" of the gifted Corsican which has been penned by Rose is an excellent piece of work and can be read with profit by the person who has made some study of

Napoleon's career as well as by those whose knowledge of it is confined to its more dramatic episodes.

The "Memoirs of My Life and Writings" by the author of "The History of the Decline and Fall of the Roman Empire" has the double value of an account of the life of a notable figure and of the ideals and methods of a great historian. How Gibbon, as he "sat musing amidst the ruins of the Capitol," conceived the idea of writing the story of one of the two or three most important events in all history, is familiar. How he went at the tremendous task is less well known but cannot fail to hold the attention of the thoughtful reader. The "Decline and Fall" itself is rather too extensive a work to be classified as a single book, except in a list that includes other works which run into several volumes. Yet one might do far worse than spend an hour a day with Gibbon until he had traced the gradual disappearance of the grandeur that was Rome. Lockhart's "Memoirs of the Life of Sir Walter Scott" also takes us into a literary atmosphere, but an atmosphere in which there is no lack of action. To live with the "Wizard of the North" as one can live in Lockhart's chapters is an experience of which too few readers avail themselves. Scott is somewhat out of fashion just now—a change for which our time is the poorer. His brave struggle to pay what he regarded as a debt of honor, however, cannot be deprived of its inspiring appeal by any shift of the literary weather-vane. Even without this element, the biography would be unusually rich in human interest. It is too long for the generality of readers, but can be perused in parts without serious loss of continuity.

The autobiography of John Stuart Mill presents the picture of a man who was a scholar from babyhood and a thinker from an astonishingly early age. It is one of the most illuminating accounts of intellectual development ever recorded. Dasent's biography of Delane, the most famous of the editors of the London Times, has the interest attaching to a picture of a man at the centre of affairs. American biography and autobiography may well begin with Franklin's story of his own life, a book which shows the limitations as well as the unusual qualities of the most extraordinary American who has yet appeared. Of the Father of His Country there are many biographies, but none of them can take the place of Paul Leicester Ford's scholarly and entertaining volume entitled "The True George Washington," which shows the man in his habit as he lived. One of the best biographies of Lincoln has been written by an Englishman, Lord Charnwood. Americans no less than Englishmen can read his book with advantage. An autobiography of peculiar interest is Booker T. Washington's "Up From Slavery," with its modest but frank depiction of the steps by which he rose from the humblest condition to a place of leadership, not only in his race but in the nation. Told in the third person, "The Education of Henry Adams" is a detached yet intimate account of the life of an important member of the eminent New England family. It is shot through with pungent comment upon the men, events and ideas of the nineteenth century.

Pliny's letters need no recommendation for anybody who has read one or two of them. While the best known of the collection are those relating to the treatment of the Christians and the eruption of Vesuvius which buried Herculaneum and Pompeii, others are almost if not quite as interesting. Lecky's "History of European Morals," Lord Acton's address on "The Study of History," Prescott's "Conquest of Mexico," Parkman's "Pioneers of France in the New World," Mark Twain's "Life on the Mississippi," and E. R. A. Seligman's "Economic Interpretation of History" include on the one hand historical narratives of unusual value and on the other, masterly interpretations of historical development. Government is a subject which ought to be of particular interest to members of a democracy. The volumes on government in the present list include discussions of fundamental principles—Aristotle's ageless "Politics" and Bagehot's penetrating "Physics and Politics"; a survey of governmental systems—Wilson's "State"; the classic analysis of American government and society—Bryce's "American Commonwealth"; the most famous of the various sketches of ideal polities—More's "Utopia"; one of the best of the ironical views of civilization—Anatole France's "Penguin Island," and a selection of historic orations. With these volumes might have been put Plato's "Republic" and Swift's "Gulliver's Travels," which appear in other parts of the list. Adam Smith's "Wealth of Nations" is placed next as bearing upon a related subject. Like some of the other books here listed, it will be read by most persons in parts rather than entire.

Poetry presents a special problem. It is easy enough to name certain long poems which every cultivated man or woman will want to read in whole or in part. It is not easy to keep the titles of short poems of distinction within moderate limits. The most practicable way of enjoying the gems of British and American poetry is to go through a volume of selections prepared for college or university extension use. There are many good collections of this kind. Drama also imposes a severe restraint upon the selector and the case of Shakespeare presents a special question: Shall the entire body of the great dramatist's work be listed as a single volume or shall a few plays be chosen as representative? One is tempted to dodge the task of choosing among masterpieces by simply setting down

the name "Shakespeare." In the present list, however, a few plays have been selected. They are to be taken, not as necessarily superior to others but merely as among those which bear the impress of genius.

Essayists are not to be swallowed whole. Yet to single out a few essays by any writer seems like overdoing the work of selection. The reader had better do his own choosing here. He will want to peruse Emerson's essay on history and Macaulay's essay on Clive, for instance, as outstanding specimens of their kind, but for the most part he will desire to follow his personal inclinations. Ruskin and Matthew Arnold fall outside the ranks of the essayists, strictly so called, but may appropriately be placed in this part of the list. Ruskin's "Stones of Venice" exemplifies in its style some of the architectural qualities which arouse its author's enthusiasm. It has decided interest, therefore, apart from its ideas. The battle between barbarism and civilization in one of its phases has had no more strenuous fighter than Matthew Arnold, whose slogan, as it would be called nowadays, "sweetness and light," was once tossed back and forth between the opposing forces with a vigor suggestive of physical combat. In "Culture and Anarchy" the leader of the attack upon the intellectual Philistines of his day discharges some of his most destructive ammunition.

Books on travel range from the merely pictorial to the philosophical. Those in the present list have been chosen without reference to their purpose, the selection being determined by the intrinsic or the historical interest of the book named. Marco Polo may be included with more confidence than would once have been possible. Long regarded as a fabricator, he is now believed to have been a fairly truthful narrator. Arthur Young's "Travels in France" belongs to the small group of books written by clear-eyed observers who had the good fortune to see conditions which were destined to be revolutionized almost as they looked. France as it was under the "old regime" but as it was rapidly coming not to be, lives in Young's pages. Darwin's "Voyage of the Beagle" has a two-fold appeal: the inherent interest of its story and its historical interest as showing the mental attitude of the man who was to give the doctrine of evolution definite form and influence. It is a book which most readers will be content to peruse in parts rather than in its entirety.

The last group of volumes in our list is composed of works of prose fiction. Not all of them can be called novels, as, for instance, "Gulliver's Travels" or "Dr. Jekyll and Mr. Hyde." The selection has been sternly limited to one book by any one author. This limitation in certain cases compels a rather arbitrary choice. Many readers would select some other romance of Scott than "Quentin Durward," for example. But there is nothing binding about a list like this. A reader is at perfect liberty to take it or leave it, or to take part of it and leave part. It proves once more that there is no such thing as an ideal list of "best" books.

Chapter Eternal

GEORGE D. SHEPARDSON, *Associate* -	**May 26, 1926**
VIRGIL POSTON, *T '15* - -	**Sept. 23, 1926**
PHILIP B. KYLE, *Ph. '26* - - -	**May 9, 1926**

Installation of Chi Chapter, Lehigh University

By *J. E. Zollinger*

Assistant Secretary, N. E. C.

FOR the official installation of Chi Chapter at Lehigh University on May 22, 1926; regality was in evidence. President Hofgren, First Vice-President, F. E. Brooks; Vice-President-elect, M. C. Hale, and Assistant Secretary, J. E. Zollinger were present and had a great deal to do with the installation. For the power behind the throne the National Executive Council expresses its gratitude to one of our alumni members, Instructor N. S. Hibshman, E '24.

He had carefully reserved a suite of rooms in Hotel Bethlehem so that the ceremony could be carried on in secret. He also furnished the lantern, robes, hats, candlesticks, candles and other miscellaneous equipment. Thanks to him we saw the city and campus from lookout point and the building and equipment for the electrical work. Most of the afternoon was spent in arranging things and rehearsing the ceremony so that it could be run off smoothly and thus be very impressive.

G. S. NAGLE A. FOSTER F. G. KEAR D. M. MONG
J. R. P. PERRY E. E. ALTHOUSE E. RICHMAN

About 4:30 the first candidate was sent to the receiving room. After rapping and answering the question for admission, the door was opened and Brother Hale masked and in a black robe, blindfolded the candidate in the already darkened room. The journey was started by leading him in and out of the different rooms. The candidate was seated and later given another trip around. All candidates met the same fate.

The charter members were initiated first. President Hofgren sat on his built-up throne and went through the entire ritual from memory in an impressive way. All parts went smoothly. The candidates must have been unnerved somewhat because they found difficulty in taking the positions directed. The certificates and emblems were there so that each initiate was presented with his own. Before the certificate was given to him, his name was read; he came forward and signed his full name in the book furnished for chapter records. Then the President gave him his certificate.

The remaining members were put through the ritual in the same way. To impress, instruct and make for a better understanding of how to carry on an initiation, the charter members watched the others receive the rites.

After a few social words, all moved into a larger room on the same floor for the banquet. As guests to the banquet we had the Professors and Instructors in the E. E. Department.

Toasts were made as well as some very gratifying and enlightening statements. The faculty seemed well pleased with the send-off and our offer to help next fall with the Chapter's own initiation.

Thus the twenty-first Chapter of Eta Kappa Nu was established in its twenty-second year at Lehigh University, Bethlehem, Pa., on May 22, 1926.

The charter members of Chi Chapter are: Ernest E. Althouse, '26; Arthur Foster, '26; Frank G. Kear, '26; John H. Metz, '27; Donald M. Mong, '26; George S. Nagle, '26; Joseph A. Nicholas, '27; John R. P. Perry, '26; Edwin Richman, '26; Alfred W. Staller, '27.

The new members who were initiated were: Challis Britton, '27; Theodore H. Kemp, '27; Norman S. Spatz, '27.

They will carry-on this year with Brothers Metz, Nicholas, and Staller.

Lehigh University was founded in 1865 as the result

of gifts of money and land from Asa Packer, of Mauch Chunk, a pioneer in the transportation of coal by canal and the builder of the Lehigh Valley Railroad. Realizing that a knowledge of more than materials and processes was necessary, Judge Packer asked the State to charter a university rather than a college, and it was granted to him in 1866.

It was no mere chance that placed Lehigh on the slope of South Mountain in the city of Bethlehem, Pennsylvania. Judge Packer knew that, in placing the University on the banks of the Lehigh River, he was establishing an institution at the very doors of the mighty industries of the Atlantic Seaboard. And to-day the University lies within a few miles of the manufacturing and mining center of ten Eastern States in which over one-half of the mining, quarrying, and manufacturing of the country is done.

In the 61 years of the existence of Lehigh University, the institution has distinguished itself by many notable achievements. In time of peace, her laboratories and teaching halls have been devoted to the advancement of the country's industries. In time of war, Lehigh and her alumni have placed all their resources at the disposal of the nation. Particularly true was this during the late war when her laboratories were commandeered by the Government for research work. In addition, Lehigh has been classed for a number of years by the War Department as a Distinguished College for its R.O.T.C. work.

Few colleges have on the campus better facilities for undergraduate life. Lehigh is particularly fortunate in having a beautiful wooded mountain side on which to build her dormitories and fraternity houses, and over half of the student body is housed on her campus. The campus and park of the University cover a total of 180 acres, while the University occupies twenty-one buildings.

Dr. Richards, former dean of the Engineering College of the University of Illinois, was inaugurated president of the University in 1922. A masterful survey by him as to the needs of Lehigh, led to the initiating of an endowment campaign for $4,000,000. in 1923, which has since been fully subscribed for. Due to the fact that the number of men seeking admission each year surpass the number that can be accommodated, an extensive building program has been planned and is now being carried out. The most recent addition is the Alumni Memorial Building, completed in 1924, in commemoration of the Lehigh men who fought and fell in the Great War. It contains the Administration and Alumni offices.

The University is divided up into three colleges, viz., the College of Arts and Science, the College of Business Administration, and the College of Engineering. The latter contains on an average about 70% of the student enrollment.

A Department of Electrical Engineering was established in the College of Engineering in 1884-85. The course covered but a year of study and dealt wholly with the practical side of electricity. In 1887-88 the course was made to cover a period of two years of study and laid particular stress on subjects in physics. The degree of Electrical Engineer was awarded to those graduating from the course. In 1888-89 the course was changed over to a four year "course in Electricity and Physics", and the degree of Electrical Engineer awarded to the graduates. It was not until a few years later that the course in Electrical Engineering made its appearance, as divorced from the course in Physics.

The Electrical Engineering Society was organized in 1887. Its object was to supplement the regular work in Electrical Engineering by the discussion of current topics in electricity and by lectures given under the auspices of the Society by engineers and by members of the corps of instructors in the department of Electrical Engineering.

The old combined Physics and Electrical Engineering building was destroyed by fire in 1900. A new building was immediately erected on the old site, and this building is to this day the home of the Department of Electrical Engineering. It is of fire-proof construction throughout, is 240 feet long by 56 feet wide and contains four stories.

In 1903 Wm. Esty was made Head of the Department of Electrical Engineering to succeed Prof. Wm. S. Franklin, who became attached to the Department of Physics at Massachusetts Institute of Technology. It has been due to the painstaking work of Prof. Wm. Esty over a period of 23 years that the Electrical Engineering course at Lehigh has risen to the pre-eminence in the professional world that it now occupies. The Department to-day boasts of five Professors and three instructors. The graduating class of Electrical Engineers on the average number between 25 and 30.

The report of Dr. Richards in 1923 advocated the erection of a new building to be wholly occupied by the Department of Electrical Engineering. Plans of this new building have since that time been drawn up and approved. It is expected that within a few years time the Campus will be graced by the presence of this new building.

Plans have also been discussed for the establishment of a Radio Broadcasting Station at Lehigh University, to be under the joint management of the Bethlehem Steel Company and Lehigh University.

The Physics and Electrical Engineering Laboratory is 240 feet long, 44 to 56 feet wide, and four stories high.

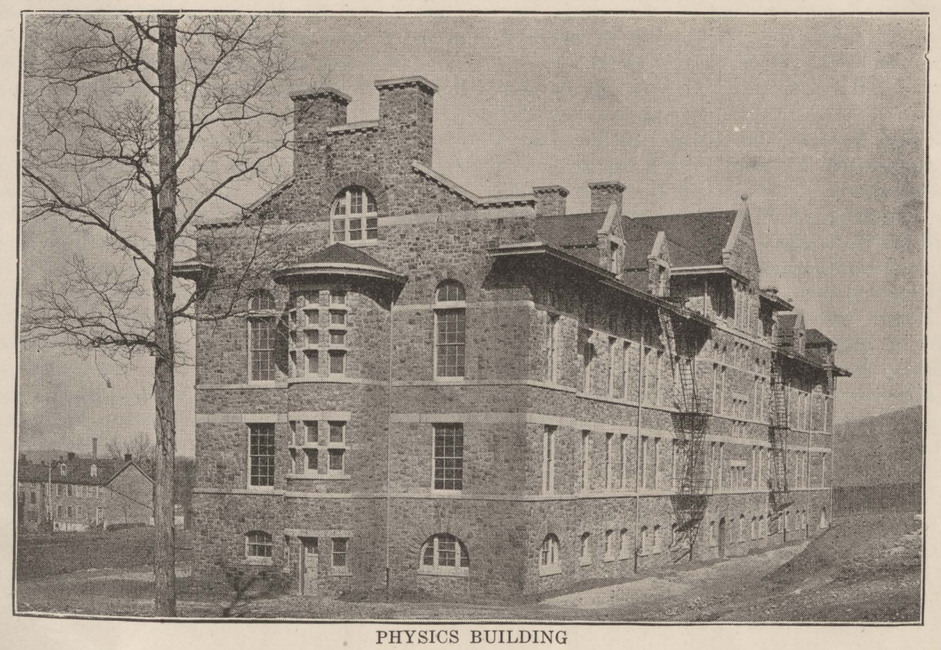
On the first floor are the Advanced Electrical Laboratory and shops of the Physics Department, the senior and junior dynamo laboratories, the shop and research room of the Electrical Engineering Department, and a storage battery room belonging jointly to the Departments of Physics and Electrical Engineering.

The Dynamo laboratory for the senior students in the west wing is supplied with power from a 75-kilowatt rotary converter receiving current from the University power plant through two 30-kilowatt transformers. The dynamo laboratory equipment, which is constantly being increased, now includes the following apparatus: an 18-kilowatt double current generator, two direct current motor-generator units, one Lincoln variable speed motor, a 4-kilowatt Westinghouse two-phase rotary converter, a 10-kilowatt General Electric six-phase compound rotary converter, two direct connected units consisting of 7½-kilowatt six-phase General Electric alternates driven by 15-horse power Allis-Chalmers motors, one 20-kilowatt two- (or three-) phase alternator built by the Department, a 35-kilowatt Westinghouse single phase alternator, a 10-kilowatt composite wound alternator driven by a 15-horse power Crocker-Wheeler motor, a pair of 3-horse power direct connecter series crane motors, three motor-generator sets converting from alternating current to direct current, four polyphase induction motors ranging from 2 h. p. to 7½-horse power, three types of single phase induction motors, two single phase commutator motors, twenty-two transformers of from 1 to 15-killowatts, including two 15-kilowatt Scott-connected transformers, a 5-kilowatt 66,000 volt testing transformer, a 6-light constant current transformer, a 30-ampere arc rectifier outfit complete, a General Electric oscillograph outfit, a Crane lecture room oscillograph, and a large variety of instruments including voltmeters, ammeters, wattmeters, rheostats, contact makers, frequency meters, dynamometers, condensers, and other apparatus.

The dynamo laboratory for the junior students on the first floor in the west wing contains the following apparatus; a 20-kilowatt Ferranti alternator driven by a direct current motor, two arc light machines, twenty arc lamps of various types, a Brackett cradle dynamometer, a Westinghouse two-phase rotary converter, a motor driven battery booster set, several types of adjustable speed motors, and other motors for direct and alternating current.

On the second floor is a small research laboratory and a large dynamo laboratory for sophomore students in Electrical Engineering, and an Electrical Engineering reading room. The dynamo laboratory for the Sophomore students in the west wing is equipped with twenty-seven direct current machines of various types, dynamotors, and several types of automatic starters and auxiliary apparatus. Apparatus exemplifying the operation of telegraph, telephone, and radio telephone and telegraph stations are here installed. The equipment in radio telegraphy and telephony includes a 250-foot antenna, 5-kilowatt transformers, oscillation transformer, a 3000-volt direct current generator, quenched gap, and several sets of receiving apparatus.

On the third floor are located the radio laboratory and the electric transients laboratory and two 200-mile artificial power transmission lines.



PHYSICS BUILDING

The Future in the Public Utility Field for College Men

By Allyn G. Smith, M '16

Brother Smith is a graduate of the University of California in Electrical Engineering. Prior to the War he was associated with the Southern California Edison Company at Los Angeles and with the San Joaquin Light and Power Corporation at Fresno, California. After the War he accepted a position in the University of California Extension Division, and for a period of five years was in charge of the development and organization of all engineering and scientific courses as Chairman of the Technical Department. He left the University of California in 1924 and is now in the Personnel Department of The Pacific Telephone and Telegraph Company at San Francisco.

MUCH ink has been spilled and much time has been spent in debate of the pros and cons of that perennial question: "Shall I get a job with a Big Business or shall I tie up with a Little Business?" It is perennial because every college man, if he is alive to his opportunities, has to face it before he graduates. He has to answer it to his own personal satisfaction, sooner or later. With all that has been said on this momentous question already recorded in previous issues of the Eta Kappa Nu Magazine, it will be fruitless for me to enter into the argument and to belligerently "throw my hat into the ring" as a challenge to all comers. So I will not attempt it but instead will try, by the assembly of a few general ideas on the subject, to start at least a few college men thinking about their future in the business world.

Now, I have no particular brief against the small business as a future for any college man. Let me admit at the outset, however, that I am more interested in the future possibilities which the big business offers, particularly the larger public utilities — the gas and electric companies, and the telephone companies. This group of utilities is one which yearly absorbs not only a large number of engineering graduates but graduates in other lines as well. Generally speaking, most men in Eta Kappa Nu have at least one, if not more than one offer of employment in this group when they finish college. Indeed, the fact that one of the group, giving a nation-wide service, has been taking one out of every thirteen technical graduates in the country each year, is a direct answer to the query, "Is the college man wanted?" The getting of a job is, however, a mere incident to ultimate success in the type of work which that job involves and when we speak of success we immediately arrive at the heart of a big problem, namely, the future which is ahead.

What is the future for a young college graduate in a big public utility? Is it good, bad, or indifferent? What are some of the factors which must be considered in determining what one's future may be in such an organization? Does success in the public utility field depend on luck, or sheer ability, on the connections which a man may have through friendship or relationship, or on a combination of two or more of these factors? After all, what is success in any line of work? Can it be measured with a yardstick or is it an immeasurable quantity dependent upon the variables of salary income, position and power, or satisfying work? Is success in a public utility company worth the candle after all, once it has been achieved to the ultimate satisfaction of the man gaining it? These are some of the questions on which, it seems to me, much thought should be given by the prospective college graduate in considering what the future may hold in store for him should he decide to invest his capabilities and his energies in a life work in the public utility field. In other words, if he is wise, and he ought to be, he should follow that caution well known in the business world—"Before you invest, investigate."

In order to analyze the situation in some of its major aspects let us consider a few facts which surround the present-day public service corporation. We shall have to do this before we can begin to discuss the several questions which have been raised. First and foremost our major public utilities are growing; they are reasonably prosperous. There is every indication that they will continue to grow and prosper. It would be burdensome to quote figures to prove this since they are readily available on every hand. The reasons why this growth is taking place are quite apparent. The major one arises from an honest and whole-hearted desire on the part of the public utilities to meet the public more

than half way in relation to the service which they sell. "Better and More Efficient Service" is no idle slogan and it has long been generally adopted and vigorously applied in one form or another by all the utilities. Growth has also resulted from a gradual rise in the standard of living. The telephone is no longer a luxury. It is a necessity. And so with the other utility services as well. More and greater uses are being found for electric power and for gas. Rates, generally speaking, are relatively lower than they were before the war; the service which they buy is better and, if I interpret the signs of the times correctly, will continue to grow better. The development of so-called "superpower" systems and the gradual achievement of "Universal Service", the telephone ideal, all have a bearing. One may well ask, "But what has this to do with my probable future in these businesses?" A great deal, I would say. Growth means new departments and new jobs and an enlargement of existing departments both as to jobs and number of men. It means steadier and more rapid promotion and greater all-around opportunities for advancement.

One of the more recent trends which contributes to the stability of our public utilities is the tendency toward customer ownership. Some interesting facts on this point were given recently by David F. Houston, former Secretary of the Treasury, among which he points out that the Bell System alone has over 525,000 stockholders and the other public utilities together, about 2,000,000 owners; all with comparatively small holdings. This trend is moving in still another direction. James E. Fullam, Vice-President of the International Telephone Securities Corporation, writing on the widening market for public utility securities, tells of the present tendency to legalize these investments by savings bank and trust companies. The percentage of failures of public utilities over a period of years has been almost negligible, he says. In fact, they cannot afford to fail for they are too closely bound up with the life of the community. The existence today of public service commissions is not so much due to the necessity of preventing the utilities from charging "what the traffic will bear", but is due more to the necessity of adjusting rates so that the utility may make a fair return on the money which it has invested.

The prospective engineering graduate, when he accepts a job in a large public utility, does not, therefore, associate himself with a grasping octopus having monopolistic ideas; he starts his career with an organization having high ideals of service and a willingness to accept for that service enough to meet its debts, with a little left over for surplus and reserve in order to remain successfully in business. After all, a public utility is no different from any other business. It is most certainly not a monopoly, for the only monopolies in this day and age in the United States are the patent monopolies and even they are not permanent. It is regulated by public commissions, to be sure; but so are all other businesses, although in not quite the same manner since regulation in this instance is by city ordinances, by state and national laws, and by the Interstate Commerce Commission in one way or another. It has been said oftentimes that a public utility is different because it is a public servant, and yet cannot this same thing be said of all businesses, directly or indirectly? The butcher, the baker, and the candle-stick maker sell to the same people which the utility serves. The only difference between the two is one of degree; of the number of people served. These facts are interesting, I think, because they do not fit in with the too-often accepted idea that public utilities are performing a work in the world which is somehow different from the general run of work and hence must be considered in a different light — even a bit suspiciously, perhaps. There is no valid reason, to my way of thinking, why any differentiation at all should be made in view of the fundamental facts, particularly where the question of future success is under consideration.

There is no doubt that the present-day public utility is a stable institution. Its very stableness is used frequently as an argument against getting a job with one. "You have a life lease on your job", they say. What should have been said is, rather, a "life lease on your company" if your performance is such that it meets or exceeds the requirements. What the average college man is looking for in the way of employment is something permanent, work at which he will be satisfied and advancement in accordance with his individual merits. The man who is not sure what he wants and goes searching here and there for the type of work which he thinks, perhaps by chance, he may fit into, is at a serious disadvantage. He drifts from job to job and eventually gets nowhere, for he must start in at the bottom again, every time he changes. Personnel managers and employment people look on him with suspicions. He is not a "sticker", they say. His college classmate who has stayed with his first job far outstrips him after a period of years.

Now, I am not an advocate of staying with a job if it does not fit. If a change is necessary, then that change should be made and as soon as possible; but it should be made wisely, with an assembly of all of the facts which it is possible to bring to bear on the situation. Success does not come in a night, except to the lucky. Most men work long and hard to achieve it, and the nearer they are to the achievement the harder they work. In estimating the probabilities of the case it is best to figure the long way rather than the lucky one. What most college men want is exactly what a few say they do not want, namely, a "life lease."

Permanency, it seems to me, is one of the main things that should be looked for in any job, and this is one of the outstanding factors which work with a public utility has to offer.

Let us consider for a moment some of the other advantages of employment with a large utility. Size in a big company usually means the existence of a highly functionalized organization, the functions themselves being closely interwoven and grouped into many departments and subdepartments. A man going into such an organization generally has to specialize in some major phase of its work. But the very fact that the tendency has been toward specialization in these large industries means that the opportunities for a college man to find some particular phase of work which fits his interests and qualifications are far better. There is greater opportunity of finding the right job on account of the varied types of work which are performed. A man who finds himself out of place in a large organization, through an incorrect analysis of his interests, or for any other reason, has, because of this fact, a far greater opportunity of transferring to some type of work into which he does fit and in which there is every reason to believe he can advance and eventually succeed.

Among the large public utilities, the feeling has become stronger that transfers from one department to another should not only be made easy in order to make it possible to put the "square peg in the square hole", but should also be made for another reason, namely, to give a man who has potential capabilities of advancement the opportunity for experience in more than one phase of work. This tendency is being put more and more into actual operation, and it is a factor to which consideration should be given by any man looking for a public utility job.

The growth of our large utilities offers other valuable opportunities which are generally not found to the same degree in other lines of work. I refer here to the possibilities which are offered in the development of entirely new jobs. I have in mind a particular instance which illustrates this very well. A young man not so very long out of college was working for the engineering department of one of our big power companies. It so happened that he was given a special problem to work on during a slack period in his regular work. Now this particular problem, although it had just begun to develop, was full of latent possibilities and importance. Our man in question grasped the situation, made an exhaustive study of it, and presented a report which led to the organization of an entirely new department in the company, a department which has continued to grow ever since. Before this opportunity existed his position was in no way outstanding. At present, however, he is supervising the work of several men and his position is recognized as being one of great importance in the organization.

I merely tell this to illustrate the point that I want particularly to bring out. Such situations are not at all uncommon in large organizations and there is always the possibility of being able to develop in this way. Opportunities for the creation of new jobs in public utility work are always present, if they will only be grasped by men capable of making the most of them.

An important thing to consider in choosing a life work with a public utility is the existence of comprehensive plans for sickness and disability benefits and pensions which provide for the building up through added service of real protection against emergencies or eventual retirement. The cost of maintaining comprehensive benefit and pension plans can be borne adequately only by our largest organizations. Most public utilities have well developed plans and programs of this general nature. The benefits which accrue to an employee under such plans are very frequently overlooked or passed over as being unimportant. This is a mistake, for they mean a great deal to the individual. The following statement by a telephone man is interesting in this connection. He says, "I imagine very few of us fellows in the business have ever taken the trouble to figure out the value of our benefit and pension plan in actual dollars and cents. I did this, not long ago, and after twenty-five years of service I found that should I leave our company to engage with some other enterprise which did not have a benefit and pension plan, that in order to replace the increment that I had in my pension I would have to pay a life insurance company $1,356 a year to buy the same benefit!"

Most public utilities also have provided means whereby their employees may purchase stock at a considerable discount or take advantage of group insurance in one form or another at a figure much less than such insurance could be obtained through applying directly to an old-line company. The savings which may be effected by these means are considerable if advantage of them is taken to the fullest extent.

The operation of the benefit plan, particularly in those cases involving disability and sickness, is also of great advantage to those who should become unfortunate enough to come within these special provisions. I know of one particular case in which a recent college graduate was forced on account of ill health to change to a less rigorous climate. Had he been working for a small company his only alternative would have been to resign and take his chance on finding a new job. Fortunately, he was an employee of a utility whose activities extended over a large territory and a transfer was arranged for him which met the requirements of his case. Such happenings are not infrequent. They

certainly do not fall in line with the too often accepted theory that our public utilities are heartless and soulless organizations.

Work in a large public utility offers many opportunities for wider associations, not only in a business way but in a social way as well. The college men in these organizations do not travel in a narrow sphere of existence unless, perchance, they do so from choice. There is better chance to meet men who are interested in the same things that they are, and this is true regardless of what those interests may be. For a college man there is a great deal of satisfaction in being associated with a group of other men who have gone through the same general type of training and whose interests go beyond the mere news of the day which one finds in the average newspaper. In many companies there are social clubs which meet regularly for the purpose of gaining wider acquaintance and for discussions of various aspects of the business. These clubs are rarely limited in membership and frequently afford an opportunity to rub shoulders and exchange ideas with managers and men alike. The points of view which can be gotten in this way are invaluable to a young college graduate.

A public utility offers many educational opportunities. Most of them recognize the fact that there is a considerable gap between the type of training which a man has been used to in college and the character of the work with which he is likely to come in contact on his first job. As a result, carefully prepared training courses are given by means of which the college man may orient himself in his new sphere of existence. These training courses generally attempt to place before him a bird's-eye view of the company and its operations in order that he may have at least a speaking acquaintance with the various types of work performed. They are invaluable, particularly for the college men who are gaining their introduction to the business world. They point out the way for additional study and no public utility employee, for this reason need go stale mentally, unless he deliberately chooses to do so. The field is wide open, and in many of our large gas and electric companies, and the telephone companies as well, it requires long study to become thoroughly acquainted with all the ramifications of the work. The general managers and other men of important position are today picked only from men who have a broad insight and who have not shown a willingness to limit their knowledge to the special job on which they may happen to have been working.

It has been my experience that there is generally no place for presidents' sons, nephews of general managers, and cousins of other important officials in the ranks of our present-day utilities. These companies are big; too big to be small, and while they may have erred in this direction on occasion in the past, there is less and less opportunity to get a job purely because of "pull" or personal relationship. A college man who goes into a public utility in these days need have no fear of this sort of thing.

The criticism has often been made that the young engineer in a big organization has little opportunity to do anything constructive—at least on a large scale and that he becomes a mere unrecognizable cog in a huge machine, without any hope of ever getting out of the rut and doing anything big. If this engineer has worthwhile qualities in him and does not expect to progress too rapidly while he is learning the job, there will be plenty of big things for him to do. Big organizations operate on a big scale, and it is not unusual for a young college man with proper experience to be given important work which frequently staggers the imagination. I know of one electrical engineering graduate who, after two years of experience in a large power company, was given the job of rearranging the entire relay system of the company. In the process of his work he had the whole electrical distribution system, amounting to millions of dollars, to pieces, as it were. Another engineer of my acquaintance, also not very long out of college, was given the important job of rearranging the carrier telephone and telegraph system which existed between two of our large cities. These jobs are not unusual for young men in public utility work. And yet it is said that there is no opportunity to do big things! The possibilities exist almost every day for the performance of such jobs, and the public service which a young college man can perform in doing them well is of incalculable value.

There is one thing which I particularly want to point out as a very important factor for any young college man to consider in choosing his life work, particularly if he favors a public utility job. It is a well-known fact that these companies are taking large numbers of graduates every year. Indeed, many companies make special effort to interest the college man by sending delegations to his university to talk with him and to make it possible for him to make a wise decision with a full knowledge of the facts in the case.

Why is it that public utilities are taking college men? One may even ask, why are they interested sufficiently to go to the expense of sending employment delegations to the colleges and the universities? The answers to these questions are, I think, obvious enough. The utilities are constantly on the lookout for talent wherever it exists. Experience has shown that such talent may be found in many of the men who attend our universities. The college graduate, from an educational point of view, is a highly selected individual. He has

passed through two separate and distinct phases of training in addition to his college work; namely, grammar school and high school. He has had the advantage of broader training, wider association, and that enlarged view of life in general which comes from at least four years of added educational experience at a time when his mind is in its most formative stage. These are not easy years and the fact that he has passed through them successfully to final graduation is, in itself, a real achievement.

College graduates, as a group, have made good in public utility work. Many of them have shown themselves capable of progressing rapidly and far, of doing bigger things than men who have not had the same opportunity, or having the opportunity, have failed to make the most of it. It is to this group among others that the utilities turn in their search for men. The employment delegation method has proved to be satisfactory both for the college man and for the company which it represents. It gives the man an opportunity to learn of the company and its work and the company has the opportunity of selecting these men who, by experience, give evidence of being able to fit into the organization and to progress. The final decision rests with the man in every case. He should therefore appear for interview whenever he has a chance regardless of his interest, for it is only by this means that he can choose wizely.

Let me point out right here from a productive point of view and from the point of view of experience that a college graduate with all of his education is no better than a high school graduate or even a grammar school graduate who has the same potential capabilities. Employment managers "make no bones" about this. They employ college men not because of their degrees, but because of what may be expected of them in the future; and this expectation is high.

Recognition is continually being given by executives in public utilities to men who can accomplish results and these men are not all college men by any means. For this reason, therefore, a college graduate stands entirely on his own feet; he is shown no favoritism. If he can produce in accordance with what can reasonably be expected of him, well and good. If he gives evidence of outstanding ability he can progress accordingly. The great cry is for men who can do things and do them well, and that cry is insistent and will continue to be so. In our public utilities today there are not enough men of this outstanding type. There is always room for them, but they must expect to begin at the bottom of the organization and progress by virtue of their ability to produce and to create. The man who starts out with the idea that he "has the world by the tail" will find rough going ahead of him.

A great deal of thought is being given by personnel managers in utility corporations to the proper selection and to the fitting of the men who are selected into the right jobs. Their studies go further than this. Prospective college graduate employees are being considered more and more in the light of where they will be five, ten, and fifteen years from the date on which they are employed. Consequently, if a college man does not appear to have those qualities which tend to make him capable of meeting the necessary requirements for advancement to important position in the years to come, he is either not selected at all or else he is eliminated early in his career. Such elimination is good for the man as well as for the organization. It means that fewer and fewer college men will find themselves in positions where further advancement is blocked by someone higher in the organization who has reached the limit of his capabilities and who has, as a result, become a fixture in his present position. This is an important thing to bear in mind; it means that one does not have to wait for his boss to die before he can go ahead.

The factors which I have just discussed are obviously not the only ones which should be taken into consideration by a college man in deciding whether or not he wants a job with one of our big public service corporations. They are, to my way of thinking, among the most important to which some careful thought should be given. All in all, it seems to me that there is but one conclusion to be drawn—namely, that the future for a young college graduate in a public utility is a good future and filled with many advantages and opportunities. When all is said and done, success with a public service corporation, and for that matter success in business generally, depends on the individual.

A little while back I asked a question: Can success be measured with a yardstick, or does it depend upon several variables? I have talked with a good many college men on this subject and have found that their ideas of success are all different. No one man agrees with another, and the reason is that each man looks at life in his own peculiar way. Many men measure success by salary alone. To others the holding of a high-sounding title with a certain degree of power is the goal for which they are striving. For still others, the work is the thing and they are perfectly satisfied to continue on for years without a large salary and without what one might call important position, provided the work which they are doing gives them the satisfaction of achieving the things which, after all, mean success to them.

[Continued on page 42]

Michael Faraday, Philosopher

H.W. Newlund, N '25

NO industry, no art, no science can ever be more than a summation of the works of the individuals who have spent themselves in its service; no realm of knowledge can disregard the history of its past, and escape decay. In our own field of electrical engineering, the preparatory years of formal education too often make of the would-be engineer a veritable high-pressure container of facts, figures, and formulae and leave him quite innocent of those habits of mind and methods of investigation which have, in the last century and a quarter, raised the phenomena of electricity from a source of parlor tricks to a controlling factor in civilized life. I have no wish to add another to the endless list of jeremiads against present-day educational technique; in fact, this trend is in great part due to a peculiar whimsy of the root-mean-square under-graduate mind, which regards anything dated prior to the Roosevelt administrations as ancient history, and therefore negligible. Yet it is certain that there is nothing which can take the place of an acquaintance with the lives and the original work of great scientists as a foundation for training in any branch of science.

And, quite aside from the above inconsequential argument, there are few stories in history more fascinating than that of the life-work of Michael Faraday, philosopher. So I found it to be; and therefore, not to be stingy with a good thing, I have attempted in the following sketch to present some of the salient features of his fifty-four years of scientific investigation.

The nature of the article has made inevitable a certain process of selection of material. Much that is of interest has been omitted; many illuminating incidents of Faraday's life have been, of necessity, passed over, and some important phases of his work dismissed with but scant attention. I would not have the reader conclude that only the material here presented was deemed to be of interest, nor that the author has fatuously held a scant phrase or two to be capable of truly evaluating long years of devoted labor.

To the reader who may wish to supplement this sketch by a fuller account, I recommend John Tyndall's "Faraday as a Discoverer." It is of no great length; but, being written by a contemporary of Faraday's who was also his friend and co-worker in the later years, it presents a most sympathetic and understanding picture of the great philosopher.

(I have called him "philosopher" here and elsewhere because that is the name that he himself preferred to that of "scientist" or "physicist".)

Michael Faraday was born on September 22, 1791, at Newington Butts, then an outlying Surrey village near London. He was the third child of his parents, James and Margaret Faraday, who had but recently moved to their location near London from the little Yorkshire village of Clapham. James Faraday was a blacksmith; a "working" blacksmith, so called, as distinguished from mere tradesmen who dealt in ironware. Michael never lost his memories of his father's shop. Late in life, while resting in Switzerland, he wrote in a letter to a friend: "I love a smith's shop and anything relating to smithery. My father was a smith."

After Michael's birth, the Faradays moved to the north side of the Thames; lived for a short time in Gilbert Street, and then in 1796 took rooms over a coach-house in Jacobs Well Mews, Charles Street, Manchester Square, where they remained until 1809. In that year they removed to 18 Weymouth street, Portland Place. Here James Faraday died. He had long been an invalid, able to work only intermittently; and now, left without support, his wife maintained the household by taking in lodgers, until her sons were able to come to her aid. She lived until 1838; supported in her declining years by her illustrious son Michael, of whom she was very proud.

Michael received but little formal schooling. In 1804 he went on twelve months' trial as errand-boy to a bookseller and stationer at 2 Blandford Street, George Riebau by name. One of his first duties consisted of delivering newspapers to Riebau's customers—an early morning task, and in many cases, he had to call for the paper after its original recipient had finished reading it, and re-deliver it to the next in line, as newspapers were not plentiful at that time.

After the year's trial was completed, he was apprenticed to Riebau. As stated in the indenture (dated Oct. 7, 1805, and still preserved in Faraday's diploma-book) he was to learn the trades of "bookbinder, stationer and bookseller."

Being of a naturally curious and inquiring turn of mind, he read many of the books that came to his hands to be bound; and in this he seems to have had Riebau's approval and encouragement. He once remarked to a friend that a book by Watts "On the Mind" first made him think, and that the article on "Electricity" in a cyclopedia which came to him for binding first turned his attention to science. He read Mrs. Marcet's popular "Conversations in Chemistry,"

and the treatise on electricity in the Encyclopedia Brittanica; supplementing his reading by such simple experiments as he could perform. Thus early in life he began to show that distrust of other men's experimental work and conclusions which so characterized his scientific career; but when he had confirmed with the work of his own hands and the evidence of his own senses some of the statements of the books, and had built a small electrical machine to produce the then commonly known phenomena of static electricity, a field of absorbing interest began to spread out before him.

During this period he also attended a course of lectures on natural philosophy; and in 1812, shortly before the end of his apprenticeship, he had the fortunate opportunity of hearing four lectures by Sir Humphrey Davy, who was, in addition to being acknowledged the greatest chemist of the time, then at the height of his popularity. Faraday made notes of the lectures, as was always his custom; later expanding them into fuller form and illustrating the whole with drawings.

With some other young men who had a common interest in science, he formed a society for mutual improvement and discussion of current developments in natural philosophy. Several of his fellow members in this group were later known for their work in solving the questions that then perplexed them; and the letters of Farraday to some of the friends whom he met in this way (particularly to Abbott, who seems to have been closest to him) show a depth of purpose not frequently found in the youth of that or any other generation. Incidentally, they also indicate a facility of expression and command of English truly remarkable, in view of his limited schooling.

He was now a journeyman bookbinder, and as such was engaged by a De la Roche, owner of a shop in King Street; but he was becoming increasingly discontented with his work, and with the prospects of a life of trade. Sir H. Davy's lectures were fresh in his memory, and the personality of the great chemist had deeply impressed him; and so, late in 1812, he wrote to Davy, expressing a wish to enter into scientific work, and enclosing, as evidence of his earnestness, the illustrated notes of the four lectures. Davy at once replied, and granted Faraday an interview with him at the Royal Institution. There was no immediate opening for him; but a short time later, Davy was temporarily disabled by an accident in the laboratory, and engaged him as amanuensis for a few days. This was for some months the only outcome of Faraday's first personal contact with Sir Humphrey Davy. Doubtless this interim, when his efforts seemed to have met with no success, was a trying time, for he now knew that he could never be contented in his present occupation.

Fortune was with him, however, for in March the post of chemical assistant in the laboratory of the Royal Institution was vacated. At Davy's recommendation, he was offered the position; he accepted; and from that time until his death in 1867 he never severed his connection with the Royal Institution.

His duties at first consisted mainly of caring for the laboratory equipment and preparing the apparatus for demonstrations given in connection with lectures. In pursuance of the latter task, he had frequent opportunities to become familiar with the various lecturers; and he studied them closely, mentally criticising their choice of illustrative experiments, their arrangement of topics, their command of language and the general effectiveness of their lectures in carrying their audiences along the desired path of knowledge. The conclusions he reached from his observations he voiced in letters to his friends. It is to be regretted that limited space forbids inclusion of certain of Faraday's letters, for in them we have some of our truest records of his real character. Many of his later discoveries were first hinted at in his private correspondence; but in these early letters he is revealed as just standing on the threshold of his scientific career, little knowing that his study of lecturing methods was to be the foundation for a record of more than a quarter century of being, as well as the ablest, England's most popular lecturer on natural philosophy.

Late in 1813 Sir Humphrey Davy invited him to come with him as his secretary on an extended tour of continental Europe. It was an opportunity not to be missed, and Faraday readily agreed. The year and a half that they spent abroad constituted an invaluable experience to a young man in Faraday's position. When they returned in mid-year of 1815, he had seen something of most of the important countries of the continent. Practically all of the principal cities of Germany, France, Italy and Switzerland had been included in their itinerary. He had met and conversed with Ampére, Arago, Gay-Lussac, Chevreul, Dumas, Volta, Biot, De Stael and many other of the leading spirits of the age; he had dined with Count Rumford, the gifted and eccentric founder of the Royal Institution. He had had eighteen months of daily contact with the leading chemist of the time. Not all of the latter association was pleasant, it is true. Sir Humphrey Davy was a man of strong and, at times, overbearing personality, and Faraday was more than once at the point of resigning his position and shipping for England; but Davy was also a man of unquestioned genius, and the neophyte in science could not but learn much from him.

On his return, he was re-engaged as laboratory assistant at the salary of 30 shillings per week, and resumed his duties on May 15, 1815. He made rapid pro-

gress, and it was but a short time until Davy was intrusting him with easy analyses. In 1816, encouraged by Davy, he made his first published contribution to science, "An Analysis of Some Caustic Lime from Tuscany", which appeared in the Quarterly Journal of Science. In the two succeeding years he published several short papers, mostly on chemical subjects.

In 1818 he became interested in the subject known as "sounding flames". Professor Auguste De la Rive had investigated the matter and had advanced a theory to account for such types of the phenomena as had come within his observation; but his conclusions failed to explain all of the known phenomena, as Faraday conclusively proved by a few simple but well chosen experiments. It was no small matter for an unknown experimenter to contradict a scientist of the standing of De la Rive, and his success must have bolstered up Faraday's self-confidence to a considerable extent.

1820 saw the dawning of a new era in electrical science. In that year, Oersted discovered the action of the "voltaic current" (i. e. current caused by the voltaic pile) on a magnetized needle; and immediately afterward Ampére succeeded in showing that every magnetic phenomenon then known might be explained by the mutual action of electrical currents. Faraday became interested in the matter; read all of the published reports of the works of Oersted and Ampére, and repeated all of the known experiments dealing with the effects which they had discovered. It was characteristic of Faraday, this refusal to depend on second-hand experimental results. He knew that in every experiment, no matter how simple, there might be effects quite unnoticed by one who had not anticipated them; also that there was more to be learned from direct observation of any physical phenomena than could ever be set down on paper. He concluded this work of recapitulation by publishing in Thomson's "Annals of Philosophy" a paper entitled "A History of the Progress of Electro-Magnetism".

It seemed logical to Faraday to expect that if a magnet was affected by an electrical current, the influence should be reciprocal; that the electrical current should also be susceptible to the force of the magnet. Accordingly he set to work to prove or disapprove this suspicion, and ended by completely verifying it, by an ingenious device of suspending a wire over a magnetic pole just protruding above the surface of a basin of mercury, and adjusting the wire so that its tip just touched the mercury. When current was passed thru the wire, it revolved around the pole of the magnet. It is recorded that he showed this experiment first to his wife, on Christmas morning, 1821.

He had married during the previous summer, and had brought his wife to live in apartments on an upper floor of the Royal Institution, where he had lodged since he was first hired as laboratory assistant. Here they continued to live until only a few years before Faraday's death in 1867; and during many of the years when Faraday's best work was done, the books of the Royal Institution show entries: "Michael Faraday—salary (with lodging, coals and candles) £100."

There were no children to this marriage; but that it was a happy one is best shown by the evidence of Faraday himself. In his diploma-book, where he bound all of the many certificates of degrees and honors bestowed upon him, there is a page bearing only this entry, written in his own hand:

25th January, 1847.

"Amongst these records and events, I here insert the date of one which, as a source of honour and happiness, far exceeds all the rest. We were married on June 12, 1821."

M. Faraday.

Also in 1821, some work was done upon the vaporization of mercury at common temperatures and investigation of the alloys of steel.

In 1810 Sir H. Davy had analyzed a hydrate of chlorine, previously supposed to be the element chlorine itself. In 1823 Faraday began an examination of this hydrate. Following a suggestion of Davy's, he heated some of the substance in a sealed glass tube. The water was driven off by the first heat and the Cl liberated in the form of vapor. With further increase in heat the increase in pressure in the tube liquefied the gas. He continued this line of investigation with other substances, and succeeded in liquefying several other gases till then deemed permanent in the gaseous state. During these experiments, an explosion drove thirteen fragments of glass into his eyes; but with almost miraculous good fortune, the injury left no permanent ill effects.

In 1825 and 1826 he published papers in the "Philosophical Transactions" on "New Compounds of C and H" and on "Sulphonaphthalic Acid." In the former paper he announced the discovery of Benzol — the foundation of the aniline dyes of the present day.

He was elected a Fellow of the Royal Society in 1823, against the strong opposition of Sir H. Davy. That Davy, who had done so much for Faraday in the decade past, and who held his esteem in the years following, should turn against him at this point, is a whim of the great chemist's nature that will probably never be explained. In 1825 Faraday was made Director of the Laboratory.

In the same year he was appointed a member of a committee to investigate and if possible to improve the methods of manufacture of glass for optical purposes. He spent almost four years in this work, and in 1829 delivered the Bakerian lecture of that year on the find-

ings of the committee. This was, incidentally, his first Bakerian lecture, and required three sittings of the Royal Society for its presentation.

While the committee did not succeed in making any important contribution to the methods of manufacture of optical glass, two results of these seemingly unproductive years had strong bearing on Faraday's later work. For the first may be mentioned the discovery of a heavy yellowish glass with an unusually high refractive index, which he called "silicated borate of lead" and which, years later, was an important factor in his discovery of the magnetic rotation of light. For the second, he engaged as a helper in these glass experiments a Sergeant Anderson of the Royal Artillery, who remained with him for nearly forty years, and for whose faithfulness and attention to duty he had the highest regard.

In 1831 he began to investigate the phenomena of electric induction, determined to answer the question why, while an ordinary electrified body had the power to cause or "induce" a similar state in adjacent bodies, no one had succeeded in obtaining a similar effect with a wire carrying a "voltaic" current. His methods were painstaking and thorough to the nth degree. As had previously been demonstrated, he found that a wire carrying a current had no apparent effect on an adjacent neutral wire; but here Faraday's acute powers of observation, coupled with a peculiar power of mental detachment from his hopes and expectations, came into play. In working with a helix of two insulated wires wound side by side upon a wooden cylinder, he noticed that a slight deflection of the galvanometer connected in the neutral wire accompanied each opening and closing of the electric circuit thru the other. He applied more power, and obtained larger deflections. He found that the introduction of an iron core into his helix increased the effect, that a magnet thrust into the coil produced the same momentary current; that two separate coils, on opposite halves of a welded iron ring, acted in the same manner. Almost all of the possible arrangements were tried, and hundreds of experiments made, in investigating this new phenomenon. All of them are described with beautiful clarity and precision in the "Experimental Researches."

In 1824 Arago had found that a disc of non-magnetic metal had power to bring a vibrating magnetic needle, suspended over it, rapidly to rest; that if the disc were rotated, the needle followed, and that if the needle rotated, it seemed to drag the disc after it. When both the needle and disc were quiescent, not the slightest attraction or repulsion could be perceived. Ampere and Poisson had also noted these effects and had tried to explain them on a basis of induced magnetic polarity in the disc. Faraday's induced currents now gave him the true explanation, now familiar, which he confirmed by experiment.

He published his results in a paper on "Magneto-electric Induction" read before the Royal Society November 24, 1831. On January 12, 1832, he gave a second paper on "Terrestrial Magneto-electric Induction" showing that all of the known effects of magneto-electric induction could be produced with the earth's magnetic field.

The above phenomena, and Faraday's explanation of them, seem commonplace enough now—it is easy to follow where one man has blazed the way. They furnished then a new and unique source of electric energy; direct conversion from any convenient form of mechanical energy was now possible. Faraday's reputation grew by leaps and bounds; while in 1830 he had had an income of over £1000. from "professional business" as he called it,—services in settling court disputes on technical matters, investigations and solutions of problems for industrial concerns—Tyndall, who knew him well, estimates that by 1832 he could have realized £5000. per year, with that sum, or double, during the last thirty years of his life. Instead, we find that in 1832 his income from "professional business" was but little over £155. It declined to £92 in 1837, and from 1839 to 1845 exceeded £22 in only one year. From 1845 until his death his income from this source was exactly nil.

Tyndall has said: "Taking the duration of his life into account this son of a blacksmith, and apprentice to a bookbinder, had to decide between a fortune of £150,000. on the one side, and his undowered science on the other."

He was for thirty years scientific advisor to Trinity House, the organization in charge of maintenance of lighthouses on the British coast. In his position as "standing counsel" as he called himself, he gave much valuable service in choosing lamps and lenses, making tests of illumination, etc. The following passage from a letter to Captain Pelly, Deputy-Master of Trinity House, is significant in showing his attitude toward financial matters:

"In consequence of the goodwill and confidence of all around me, I can at any moment convert my time into money, but I do not require more of the latter than is sufficient for necessary purposes. The sum, therefore, of £200. is quite enough in itself, but not if it is to be the indicator of the character of the appointment; but I think you do not view it so, and that you and I understand each other in that respect."

Faraday had contributed many of his papers to the "Quarterly Journal of Science." In 1832 he collected these and other papers in a small octavo volume, prefaced:

Papers, Notes, Notices, &c., &c.
published in octavo
up to 1832
M. Faraday

"Papers of mine, published in octavo, in the 'Quarterly Journal of Science' and elsewhere, since the time that Sir H. Davy encouraged me to write the analysis of caustic lime. Some, I think (at this date) are good; others moderate; and some bad. But I have put all into the volume, because of the utility they have been of to me — and none more than the bad — in pointing out to me in future, or rather, after times, the faults it became me to watch and to avoid."

"As I never looked over one of my papers a year after it was written without believing both in philosophy and manner it could have been much better done, I still hope the collection may be of great use to me."

M. Faraday

August 18, 1832

The above needs little comment. It shows one side of Faraday's nature—his unresting self-criticism, his deep humility where his own achievements were concerned. Lest it give a false impression, let it be recorded that Tyndall, who worked with him for years, called him "a man of excitable and fiery temper": and we have ample evidence to show that when the dignity of science was assailed, or his own integrity questioned, no man could be more unbending in his pride. It is not the least of Faraday's achievements, that he knew the proper places of humbleness and pride, and used them so in his own life.

The next problem to engage his attention was the mutual relation of the different forms of electricity. He reviewed the evidence upon the question, whether the electricity of the dynamo, the voltaic pile, the gymnotus and torpedo, magneto-electricity and thermo-electricity, were in reality but differing manifestations of the same force. He decided in the affirmative, and stated his views and supporting evidence in a paper on "Identity of Electricities", read before the Royal Society on January 10th and 17th, 1833.

He continued along this line in making quantitative comparisons of the different forms of electricity. In much of this work he used the power of chemical decomposition as his basis for comparison, and this led him to another discovery: viz., that many compound substances, non-conductors in the solid state, were good conductors if liquefied or in solution; and that (with but one exception) in all of the observed cases of current flow thru a solution, decomposition accompanied the passage of electricity. On May 23, 1833, he delivered a paper "On a New Law of Electric Conduction"; and on June 20 he gave another to the Royal Society, "On Electro-Chemical Decomposition", in which he sought to answer the questions why, and thru the agency of what force, does the electric current tear apart the constituents of the compound in solution. He combats vigorously the notion of "polar attraction", which was then generally accepted; proving its inadequacy by a few beautifully conclusive experiments.

Faraday always deplored the too easy use of vague symbols, names, and theories, as tending to circumscribe the intellect and restrain thought in old and worn-out channels. Accordingly, when his work at this time necessitated the invention of a new terminology, he enlisted the aid of a scholarly friend, Dr. Whewell, to insure that his language should be adequate and precise. The terms "electric", "electrolyte", "electrolysis", "anode", "cathode" and "ion", so originated, first appear in his paper on "Electro-Chemical Decomposition", presented to the Royal Society on January 8, 1834. Here he demonstrated, by numberless and exhaustive experiments, that (to quote the words of Tyndall) "under all circumstances the decompositions of the electric current are as definite in character and in proportion as the chemical combinations which gave birth to the atomic theory." In Faraday's own language, his conclusions were: "That for a constant quantity of electricity, whatever the decomposing conductor may be, whether water, saline solutions, acids, fused bodies, &c., the amount of electro-chemical action is also a constant quantity, i.e. would always be equivalent to a standard chemical effect founded upon ordinary chemical affinity." Here we have the first disclosure of those principles of electrolysis which today are known as Faraday's Laws.

He now began to study the voltaic pile, in an effort to determine the true source of its energy. Volta himself had adduced a beautifully simple explanation of its action: the so-called "contact theory", holding that the energy arose from the contact of two dissimilar metals. This theory had been accepted by most of the philosophers of the time; but Faraday's work in the chemical activity of the electric current had led him to other conclusions. He proved by experiment that the action was not dependent upon contact of the metals, and that it could only be logically explained by chemical activity. So deep-rooted had Volta's theory become, however, that it was not until after 1840 that he forced its adherents to finally abandon it.

Here it may be well to note two fundamental beliefs which Faraday seems to have held during his entire career, and which powerfully influenced all his work. The first, which he held in common with many others, was a conviction of the essential harmony, perhaps even the unity, of all the forces which affect our universe—a belief in the simplicity of nature. This led

to the suspicion that perhaps light, heat, magnetism, electricity, chemical attraction, were but names for divergent manifestations of the same power.

The second arose from a deep-rooted repugnance to the idea, then prevalent, of action at a distance. He refused to believe that one body might exert force upon another at a distance from it, without the mediation of anything by means of which the force might be transmitted. Much of his work on the effects of dielectrics interposed between charged plates was done in search of the truth of this matter.

The last memoir included in the first volume of the "Experimental Researches in Electricity" deals with methods of electrical excitation, and is dated June, 1838. In 1840, the final and demolishing attack on the "contact theory" was made.

In the same year, his health failed, and the loss of memory which troubled him much in later years, and to which he had previously alluded in his letters, began to grow upon him. In 1841, he removed to Switzerland to recuperate. It was almost the first long respite from work that he had had in more than twenty-five years, and his letters show that the necessity of idleness troubled him greatly.

In 1838 he had utilized polarized light in studying the condition of transparent dielectrics subject to severe electric strain, but had obtained no satisfactory results. His belief in the probability of mutual relations between light, and the electric and magnetic fields, was, however, not so easily shaken; and upon his return from Switzerland he continued the work. Literally hundreds of experiments were made, using as many materials, without perceptible results. Finally he chanced to use a specimen of his heavy glass, produced years before in the course of his work on the committee. He passed a ray of polarized light thru the glass, parallel to the direction of a strong magnetic field, and found that the plane of polarization was rotated thru a small angle. He later, by using a very strong field, obtained this effect with many other substances.

This discovery was communicated in a paper of the singular title "Magnetization of Light and the Illumination of the Lines of Magnetic Force", in November, 1845.

The next great step in discovery was announced in a memoir "Magnetic Condition of All Matter" on December 18, 1845. He had found that a fragment of his heavy glass was repelled by a pole of a powerful electro-magnet. A bar of the same glass, suspended between the poles, tended to assume an equatorial position, at right angles to the polar axis. Subsequent trials with mineral salts, acids, alkalis, alcohols, glass, phosphorus, resins, oils, vegetable and animal tissues, and many other substances, convinced him that all matter was subject to the influence of the magnetic field, though in varying ways. He also advanced possible explanations of the nature of the forces concerned.

He later took up the subject of the magnetic properties of flames and gases. His study of the magnetism of gases led him into speculations on the influence of the atmospheric envelope upon the earth's magnetic field; and he attempted to explain the variations in declination of the compass in terms of atmospheric conditions. This investigation was spread over several years, and marks the beginning of the last phase of his work. In this period he also touches Magne-Crystallic Action, or the magnetic properties of crystalline substances.

The last memoir in the third volume of the "Researches" is dated February 7, 1855, and deals with the time-factor of the electric wave in subterraneous telegraph wires. The principal features of his last years of active work are his developments of the conception of lines of force, his conclusions on ray-vibrations, and his speculations regarding the underlying principle, the nature, of matter itself.

Thus far, we have touched upon some of the principal features of Faraday's work—his scientific life. Many matters of interest have been, of necessity, omitted. His career as a lecturer on natural philosophy might well be given more space: its story shows conclusively that he was far removed from the dry-as-dust, pedantic creature which the popular mind too often associates with the research laboratory. His Friday evening lectures were, for many years, so popular that it was difficult to obtain a seat at them. The greatest figures in the social and political life of the times came again and again to hear him, captivated, not by the conjurer's tricks which so often characterize so-called "popular" science (for Faraday never allowed his lectures to fall below that high plane of intellectual honesty and devotion to truth on which all of his work was based) but by the pure brilliancy of his intellect and the charm of his personality. For many years he gave the Royal Institution's Christmas lectures to children, (a custom originated by him); and it is said that no one else ever enjoyed such popularity with these juvenile audiences. His enthusiasm, his boyish delight over a successful experiment, and the simplicity and clearness of his language all helped him to win the favor of the children. And there was much meat in the entertainment of those holiday talks, as anyone may find by reading "The Chemical History of a Candle", and others of the series.

The variety of his interests may be partly shown by a mere list of some of his published works. "On the Practical Prevention of Dry Rot in Timber"; "On a Peculiar Class of Acoustic Figures"; "On the Alleged

Decline of Science in England"; "On the Ventilation of Lighthouse Lamps"; "Observations on Mental Education"; —these are only a few, but enough to show that his thinking was by no means confined to a narrow field.

He was by nature an experimentalist. It has been said that in mathematics he never went beyond simple algebra; and it is certain that, in his "Researches" and other works, one finds little use of the purely theoretical method of investigation. However, Clerk Maxwell, in a prefix to his "Treatise on Electricity and Magnetism", wrote as follows:

"I found, also, that several of the most fertile methods of research discovered by the mathematicians could be expressed much better in terms of ideas derived from Faraday than in their original form . . . ."

When a new problem presented itself to Faraday, his first approach was usually in the nature of a complete review of all that had previously been done toward its solution. This involved repetition of the known experiments and manifestations, for he was never content to accept experimental results at second hand. Then, when he had stored away in his mind the results of all of the known experiments, and had seen the forces involved at work in all of the ways yet devised, he turned the light of his trained imagination upon the results of his observations: detecting, where another would have seen only unconnected phenomena, the relation of cause and effect, and the working out of immutable laws. Some may object to my use of the word "imagination." It is used advisedly; for many of Faraday's discoveries cannot be accounted for by a definite, reasoned progression from step to step of known facts. His discovery of the magnetic rotation of polarized light may be cited as an instance. There was no known evidence to point the way to the discovery of this relation; yet he had a conviction of its existence strong enough to carry him thru hundreds of unsuccessful experiments to the verification of his theory. And here we come to the third step in his method—that of experimental verification. He accepted nothing that would not stand every test that could be applied—he subscribed to no theory until it had explained all of the known phenomena of the subject. In devising experimental tests of a suspected relation, and in the skill and ingenuity which he brought to their application, he has had few equals.

The writings of few scientists are so abundant in speculation, in flights of the fancy, as those of Faraday. It seems that immediately he perceived a new relation, a hitherto unsuspected force, his mind leaped ahead to possible effects not at all apparent from the evidence in hand. At the same time, he never confused these theories and speculations with proven fact. This distinction stands out in his "Researches" as clearly as printed labels: "this I suspect", he seems to say, or "this may be true"; *"but this, I have proved, and here is my evidence."*

In most of the records of his personality left to us, the salient feature seems to be his personal charm, the spell of an intensely "human" nature. He was given to quick enthusiasms: it is said that he took as much delight in a successful experiment as any boy, and that, on occasion, the completion of a particularly striking demonstration was the signal for a veritable dance of triumph around the laboratory table.

His humility has often been mentioned; but it was, essentially, the expression of a personal pride too deep for mere ostentation or vanity. He was, by nature, quick to anger, as malingerers and hypocrites sometimes discovered; though his temper was well controlled, and not often in evidence.

He lived almost entirely in the world of science. Unlike his great predecessor in the Institution, Sir H. Davy, he took no pleasure in the distractions of social life; nor did any other current from the so-called world of affairs seem to have influenced the course of his life. In his letters and other writings, no trace is found of the troublous political times in the Island, or of the many colonial difficulties of the Empire of that day. He seems to have gone his way uninfluenced by these external tempests, quite sufficient unto himself in his work.

Yet it must not be thought that he was a recluse. One who was his friend for many years said of him in this respect: "There was no trace of asceticism in his nature. He preferred the meat and wine of life to its locusts and honey." Again, Tyndall speaks of him as often, of an afternoon, stopping into the laboratory where he was at work, and urging him off to the apartments above for a cup of tea and a long chat; and such informal friendliness seems to have been always characteristic of his relations with those about him.

Few greater tributes have been paid to any man than that of Tyndall's little book, "Faraday As a Discoverer": and it is quite significant that that volume, dealing with the life and work of the man who, more than any other of his time, pushed forward the frontiers of scientific knowledge, closes, not with an eulogy of his achievements, but with the simple words of a friend who knew and loved him well:

"Not half his greatness was incorporate in his science, for science could not reveal the bravery and delicacy of his heart."

NOTE: For the material here presented I am indebted to the biographies by W. G. Tucker, S. P. Thompson, and John Tyndall; to "The Life and Letters of Faraday", by H. B. Jones; and to miscellaneous papers and writings by other authors.

Engineering Education---Its History and Prospects

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IN order to gain a true perspective of the subject of engineering education, one must consider its early history in the United States. The first American colonies were forced by Parliament to limit their production to agriculture and raw materials, and when they made the non-importation agreement in 1774, there appeared an urgent need for skilled workers in all mechanic arts. This situation was relieved by the formation of societies which exerted all possible effort to encourage the useful arts and by prizes offered "for the best achievement in every essential line of industry." After the war, similar activities were made necessary by the fact that England attempted to stop the development of industries by underselling methods.

During the years immediately following the war, many engineering developments were made, notably:

1787 —First flour mill machinery.
1790 —First textile mill driven by water power.
1793 —Invention of the cotton gin.
1801 —First high-pressure steam engine.
1801 —High-capacity double steam pump.
1807 —First steamboat.
1786-93—Several canals begun.

The war of 1812 again made it necessary that American industries manufacture all necessities, and this, together with the fact that much of the soil was becoming exhausted, produced a very urgent demand for scientific information which would lead to greater production in both agriculture and manufacturing.

As a result of this demand, the Rensselaer Polytechnic Institute was established at Troy, New York, in 1824. The curriculum, which was one year in length, contained a great variety of subjects. During the last nine weeks of the year, a study was made of the practical applications of the sciences previously studied. In 1835, instruction in civil engineering was added and students who completed the new curriculum were awarded the degree of Civil Engineer. Following a thorough study of instruction in French technical schools, the Rensselaer curriculum was lengthened in 1849, to three years. The first half of the curriculum was planned so as to lay a general foundation for all engineering, and the last half contained courses designed to allow for specialization in some particular branch.

In much of the early demand for such schools, the need for training as an aid to industrial production was very strongly emphasized, but there was also a rather insistent demand for instruction in science as part of a liberal education.

The Lawrence Scientific School at Harvard and the Sheffield Scientific School at Yale were established in 1847. At the same time, the University of Michigan decided to give a course in civil engineering. No other engineering schools were established before the Civil War[1].

One of the most significant steps ever taken in providing for higher education was the passage by Congress of the Morrill Act in 1862. By this Act, the National Government presented to each State in the Union 30,000 acres of public land for each senator and representative in Congress. The purposes as stated in the Act were, " . . . 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 mechanical arts, . . . in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."[2]

The results of this Act were extremely gratifying to those who had been appealing for more technical schools. In 1870 there were seventeen such schools as compared with the four established before 1862. The number continued to increase very rapidly, and there were forty-one in 1871, seventy in 1872, and eighty-five in 1880[1]. At the present time there are approximately 130 engineering schools of college grade in the United States.

A number of these early schools were called industrial universities because the greatest demands for them had been based on industrial needs. The idea that manual labor occupied an important place in their training soon became so widespread that many objections to such names arose, and changes were made. For instance, the Illinois Industrial University became the University of Illinois in 1885.[3]

Although the first schools offered civil engineering only, the curricula were soon extended to include several branches of science and engineering. The

1. For references see end of paper.

Massachusetts Institute of Technology, which was established in 1865, offered six four-year curricula as follows:

Civil Engineering
Mechanical Engineering
Mining Engineering
Practical Chemistry
Architecture
General Science

The first curricula of the Illinois Industrial University, established in 1867, were:[4]

Agriculture
Polytechnic—including
  Mechanical Science and Art
  Civil Engineering
  Mining and Metallurgy
  Architecture and Fine Arts
Military
Chemistry
Natural Science

Four years were required for the completion of each.

The above examples are fairly representative of curricula offered by all of the early technical schools. The general plan in all cases was to provide training in mathematics, drawing, physics, chemistry, etc., in the earlier parts of the curricula, and to have the work in applied science follow such training according to the plan used in French schools. English and foreign languages were usually included in the curricula.

The number of curricula in engineering increased very rapidly with the extensive development which occurred in the applications of engineering knowledge of all kinds. There are now available curricula in about forty branches of engineering, including aeronautical, agricultural, architectural, automotive, ceramic, chemical, civil, electrical, marine, mechanical, metallurgical, mining, sanitary, etc.

The great increase in the number of curricula offered has been accomplished by numerous changes in their content. The chief tendency has been to include more technical subjects to keep pace with the phenomenal expansion of engineering activities. This expansion itself has made even more necessary than before a very thorough education in the fundamental subjects. Hence, serious overcrowding has resulted.

This has been relieved to some extent in many schools by the growth, from each curriculum in a particular branch of engineering, of several curricula covering the various sub-specialties. This process is only a partial remedy, however, because some of the sub-specialties have grown into branches of great magnitude, and the growth has by no means ended.

The type of curriculum now in most general use is one leading to a Bachelor's Degree in a particular branch of engineering (any one of approximately forty) at the end of four years. Such a curriculum contains a common core of subjects required of all engineering students, and consisting of the following groups of subjects:[5]

Science: Mathematics, chemistry, physics, mechanics
Mechanics Arts: Drawing and shop work
Humanities: English, foreign language, economics, etc.

These foundation courses are followed by the various engineering subjects considered essential in the specialized curricula. As a general average, the student's time during the four years is distributed about as follows[6]:

Languages and humanities .....19 per cent
Mathematics and sciences .....29 per cent
Engineering subjects .....52 per cent

Since the languages and humanities group receives only 20 per cent of the time, and English and foreign languages are usually strongly emphasized, little or no time is spent on certain very important subjects such as biology, economics, geology, history, political science, psychology, business law, etc.

The group of subjects including mathematics and the sciences, principally chemistry and physics, receives strong emphasis in nearly all curricula because these subjects really constitute the foundation of all engineering. These, together with the group mentioned above, are usually given in the first two years.

Drawing and shop work are usually considered very essential subjects, and receive their proper proportion of time. The value of shop work, however, has been seriously questioned during the past few years. Many experiments in the handling of such courses have been tried. In a few schools, the university shops have been operated on a production basis in order that students might have experience as production managers, foremen, machine operators, etc., and thus receive a training designed to enable them to understand shop operations of all kinds. Others have developed cooperative courses with neighboring industries so that shop training as well as many other kinds of training can be obtained under practical industrial conditions. Throughout the period covered by these experiments there has been a considerable strength of opinion that shop work is being allowed to take time which should be allotted to other subjects, and the reasons why all engineering students should develop facility in handling tools have not been clearly shown.

Following these two years of preparation, the latter half of the curriculum is usually nearly filled with engineering subjects. This makes it necessary that each student decide early in his university career which one of the many branches of engineering he is most interested in and best fitted for. The time at

which such a decision must be made if he is to graduate with his class depends upon the school chosen. In some it is as early as the beginning of the first year. A large number require this decision at the beginning of the second year, and about one-fourth permit it to be made as late as the beginning of the third year. Very few schools permit greater delay[7].

During the work of the last two years, there is usually a considerable number of courses dealing with the various phases of the specialty chosen. There are also courses in related branches of engineering. Thus a student in civil engineering is usually required to take a course or two in electrical and mechanical engineering, and a student in electrical or mechanical engineering usually takes surveying in the civil engineering department. However, the major portion of the time is spent on the subjects closely related to that chosen for specialization.

In connection with the very thorough investigation of engineering education now being conducted by the Society for the Promotion of Engineering Education, many questionnaires have been used to secure information on all phases of education and related matters. One such questionnaire now being circulated gives ten divisions of electrical engineering, and asks which ones are considered so important that special curricula in them should be offered.

A serious result of the tendency to keep adding technical courses to curricula which are already completely filled is found in many schools in which the requirements for graduation in engineering include a considerable number of units more than required for graduation in other curricula. It is quite common to find this situation made more serious by the fact that there are few if any courses in subjects which prepare men for dealing with people, namely, citizenship, economics, political science, etc., or subjects which provide any cultural value. Many such curricula are extremely rigid, and allow almost no choice of subjects. Therefore, students are expected to follow a certain list of courses with very little thought as to their own interests.

The established order of subjects in most curricula, *i. e*, languages, chemistry, physics, mathematics, mechanics, drawing, and shop work in the first two years, and engineering subjects in the last two, is often severely criticized because practical applications always follow theoretical principles. Another result of this order of subjects is that the students have very little contact with engineering or engineering faculty members during the first two years. Several institutions have tried the experiment of giving engineering problems throughout the first year. The success has apparently been great, as such work stimulates the students' interest and assists in making the final decision as to the special branch of engineering in which they wish to specialize. However, it seems to be impossible to coordinate theory and practise in a curriculum in such a manner as to meet all objections. Certain fundamental subjects must precede the more advanced subjects, and no Utopian scheme which includes all subjects mixed in proper proportions and arranged in ideal order has been proposed. It seems that the students of a worth while type should be able to maintain their interest through two years of work in fundamental subjects. It is a serious question whether one who cannot do so does not more properly belong in a trade school than in a university.

The investigation now being conducted has shown that about 62 per cent of the students admitted to engineering curricula fail to graduate, and the elimination occurs largely in the first two years[8]. This fact is causing a serious consideration of the factors involved with the hope that the mortality can be reduced. It has been suggested that the adoption of two-year curricula leading to a certificate or diploma, and preparing students definitely for certain kinds of technical employment, might be a satisfactory solution. There are a number of very serious objections to this procedure. Such a two-year curriculum would not provide the most suitable first two years' training for those who wish to complete a four-year curriculum, and it would be difficult or impossible for most institutions to provide facilities and personnel to handle both classes of students. The most serious objection, however, is the fact that this would definitely lead many able men into mediocre technical positions where their future progress would be slow. The failure of a student in mathematics or some of the other subjects placed early in the engineering curricula does perhaps indicate that he cannot be successful in the higher types of technical work, but it by no means indicates that he cannot become a successful man in the business or management side of engineering.

It seems obvious that the greatest need is for some means of determining what each student is best fitted for and the type of intellectual effort in which he is most interested. If each could receive expert assistance in the determination of his strongest natural aptitudes, the number of such eliminations would be greatly reduced. Many men now turned out as failures in the engineering curricula would be highly successful in some field of human endeavor, and this would be a far more satisfactory outcome than would be obtained by guiding all such men into mediocre technical positions.

To sum up the characteristics of most of the curricula now in effect: They are too rigid in that little allowance is made for the interests or initiative of the students when a decision has been made to specialize in a particular branch. This decision must, in most cases,

be made before students are mature enough or have had sufficient experience to decide wisely. They devote too small an amount of time to broad education and too much to narrow specialized training.

A number of universities have developed five- or six-year curricula in order that more general subjects might be included without omitting the engineering courses which are considered necessary. In several cases no degree is received until the completion of the entire five- or six-year period.

The cooperative type of education has some well recognized advantages in schools of all grades. The Massachusetts Institute of Technology and the University of Cincinnati are the two outstanding examples in the engineering field. At the former, the cooperative curriculum is five years in length. The first two years are the same as the usual electrical engineering curriculum, but during the last three years, alternate terms, including summer terms, are spent in the industries. The fifth year is devoted to graduate work and research in both the Institute and the companies. Each man has a choice of manufacturing and utility companies, but works in the same company during the three years. His compensation averages about $1500 for this period.[9]

The ideas expressed below, regarding some of the ideals of engineering education, are not those of any one man alone, but represent the aggregate opinion of the author and others. An earnest effort has been made to include the best thought on the subject.

The requirements of engineering education could be determined more definitely if there were a generally accepted definition of engineering. The following definition was given in his president's address in 1908, by Past-President Stott:

> "Engineering—The art of organizing and directing men, and of controlling the forces and materials of nature for the benefit of the human race."[10]

The first part of this definition shows that an important part of education consists of subjects which will enable those men who will become executives to develop more rapidly.

Probably a large majority of undergraduates in engineering schools believe they will be engaged for many years in work primarily technical. The results of the S. P. E. E. investigation show that of the three most recent classes 71 per cent are in work primarily technical, while more than 70 per cent of those in classes out fifteen years or more are in work primarily administrative.[8] Such records certainly indicate clearly that a broad education is more important than training in technical subjects. In 1916 a circular letter was sent to thirty thousand members of the four large engineering societies requesting them to number six groups of qualities headed Character, Judgment, Efficiency, Understanding of Men, Knowledge, and Technique, in the order of importance given them in accounting for engineering success and in considering young men for employment. Of the seven thousand replies received, 94.5 per cent placed the Character group at the top of the list, and about the same number placed Technique at the bottom[11]. Success in engineering obviously depends upon many factors besides technical knowledge and skill. The really successful engineer must be able to coordinate theory, practise, and economics, and to handle men. As shown above, most of the engineering curricula now in effect were planned in the earlier years of engineering education, and the changes made since have consisted principally in the addition of more technical courses. Most of the curricula furnish excellent preparation for certain types of work into which some of the graduates enter. On account of the extremely rapid progress that has been made in many branches of engineering during the past few years, the applications of engineering knowledge are now so many and so diversified in character that any curriculum designed to meet directly certain needs in industry may indeed prepare men in a most excellent manner for those needs, but fail utterly to prepare them for a great range of engineering problems, both executive and technical, which all graduates will be called upon to solve.

The very strong and growing tendency to choose executives from men with engineering training is a force which must be reckoned with. Problems which executives meet are becoming so complex and so closely associated with fundamentals of engineering that some technical knowledge is essential. No one believes the schools can train executives, as ability in this direction depends primarily upon inherent characteristics. However, if engineering graduates are to receive their fair share of such positions, they must be given the broad, general foundation which is absolutely essential.

During the past few years many high executives in some of our largest industries have advocated a broad type of training for engineers. In employing recent graduates, they prefer to obtain men who have had a thorough training in fundamentals and who have not specialized in some small branch of one of the principal types of engineering.

What, then, are the principal characteristics of a satisfactory engineering curriculum? The answer to this question depends upon the types of activity for which the schools attempt to prepare men. In the present stage of development, it seems necessary to recognize the needs of two general groups of students, *viz.*, those who expect to spend their lives in highly technical design or research, and those who will be engaged in commercial, industrial, or administrative phases of engineering. Both groups need a broad

foundation consisting of such subjects as English, economics, biology, geology, history, business law, political science, etc., and thorough training in chemistry, physics, mathematics, mechanics, and other subjects which make up the heart of engineering. Such training should be mixed with and followed by courses giving the fundamentals of all of the principal branches of engineering, and there should be a reasonable amount of time available for elective subjects. Thus far there is no serious difference between the wishes of executives in industry and teachers of engineering. It therefore seems that the chief cause of argument is the relatively small group of men who will engage in research and other highly technical phases of engineering. This group must have better opportunities for the development of research ability and for specialized study than can be provided in any four-year curriculum which contains sufficient training in fundamentals. It seems clear that the usual type of four-year curriculum fails to meet the needs of all except those who wish to remain in the specialized divisions of engineering which do not require either a very broad training or an advanced technical education.

Many professional engineers believe a university curriculum should provide broad and thorough training in the fundamentals of engineering, and that considerable emphasis should be placed upon humanistic subjects such as English, economics, sociology, history, etc., not merely on account of their usefulness to the engineer, but also on account of their broadening influence[12]. Another phase of the investigation of engineering education now being conducted has developed the strength of this demand. The opinions of 1931 graduates of the classes of 1919, 1914, 1909, 1904, 1899, 1894, 1889, and 1884 on the principal objectives of engineering education are as follows[13]:

	No.	Per cent
To train broadly for the general needs of the industry	398	20.6
To train for specific needs of specialized divisions of engineering practise	228	11.9
To provide the former type of training for the majority, but provide the latter type for those who desire to spend the additional time required	1304	67.5

The enormous physical plant which has been built up during the last few decades has produced problems never thought of in the early engineering curricula. The country-wide net-works of railroad, telephone, power, and radio systems have brought with them a host of problems in all branches of engineering, ranging by degrees from management, with all of its extremely complicated personnel and technical questions, on the one side to the most advanced scientific research, with its exacting demands in mathematics and the sciences, on the other. The size of the field in which a young engineer finds himself shows clearly the futility of any four-year curriculum of a specialized nature. The only adequate preparedness for such a field is a broad education in the humanities, fundamental science, and engineering fundamentals.

The results of the investigation indicate that the most serious criticism of engineering education arises from the lack of training in business and economics[14]. The fact that success depends largely upon a good understanding of those subjects seems to be very generally recognized.

It has been said that engineering graduates of the past have risen to high executive positions and that this indicates that no great changes in curricula are necessary. Many of the questionnaires covering various phases of the investigation contain replies which show that in general engineering alumni think the curricula were not seriously deficient in any important respects except in the lack of business and economics. It must be remembered, however, that the questionnaires were planned to bring out the facts regarding existing curricula, and those who answered them were given no real opportunity to express their opinions of the recent movement toward more liberal engineering curricula.

In 1920 Stanford University put into effect the Lower Division plan which replaces the major department system during the first two years. The principal object is to require more training in fundamental subjects. During this period, the students are registered under the supervision of the Lower Division Committee which is appointed by the President. Each is required to take certain subjects and to choose other subjects from specified groups. Some of the requirements can be met by certain high school subjects. The requirements do not completely fill the first two years, and the remainder of the time can be devoted to electives. The following is a brief summary of the requirements[15]:

Group Requirements

I Languages and literature and formative art. 18 units
II Natural sciences and mathematics ..... 18 "
III Social sciences ..... 18 "

Subject Requirements

English composition ..... 6 "
Foreign language .... 22 units in one, or 15 units in each of two foreign languages
May be anticipated in high school in whole or in part.
Biological science ..... 9 units
Physics or chemistry ..... 9 units
One of the sciences may be anticipated in the high school.
American history ..... 9 units
General history ..... 9 "
One of the history requirements may be anticipated in the high school.
Citizenship ..... 12 units

At the beginning of any quarter, a Lower Division student may designate the department in which he expects to register during the last two years. Those who thus make a tentative choice of major subject are then advised to consult the department regarding the most suitable courses to take as electives during the first two years.

In the autumn of 1924, the President appointed a special committee made up of representatives of all of the engineering departments, and requested that the various phases of work in engineering be considered and recommendations be made to him. That committee presented its report in March 1925. In this it recommended that a School of Engineering be organized, that a more general type of engineering curriculum leading to the degree of A.B. in Engineering be adopted, that the department curricula, with certain modifications, be retained at the option of the departments, and that two-year graduate curricula leading to the degree of Engineer be adopted by those departments which had been requiring only one year. The recommendations were adopted by the University, and Professor Theodore J. Hoover, Executive Head of the Department of Mining and Metallurgy, was appointed Dean. Committees were appointed last October, and the registration of students in the tentative form of general engineering curriculum was begun in January 1926.

A revised form of curriculum has recently been adopted by the Faculty of the School of Engineering, and a copy of it is given below.

This curriculum is founded on the belief of many that any considerable amount of specialization in engineering subjects during a four-year course is undesirable. All students should have a good foundation in general or cultural subjects. In addition to this, engineering students must have rather extensive training in chemistry, physics, and mathematics. There are a number of subjects such as mechanics, hydraulics, surveying, geology, business law, etc., which all engineering students should take. Finally, a young man who hopes to become a broad minded and well balanced engineer must have some knowledge of the contents of all of the principal branches of engineering, first, in order that he may be able to choose more intelligently the branch he wishes to follow as a specialty, and, second, in order that he may be able to consider all problems in their proper relation to the whole field of engineering. It is desirable also that such a curriculum allow a reasonable amount of time for elective subjects.

The above curriculum is not considered final. It is hoped that improvements can often be made in it. However, we believe it does follow closely the ideals expressed above.

The decision has recently been reached that the A.B. degree will not be awarded in the separate branches of engineering at Stanford after 1929.

The graduate study in each department is to continue over a two-year period leading to the degree of En-

FOUR-YEAR CURRICULUM LEADING TO THE DEGREE OF BACHELOR OF ARTS IN ENGINEERING**

FIRST YEAR, TOTAL UNITS, 44

Subject	Course No.	Autumn	Winter	Spring
Foreign Language		3	3	3
Linear Drawing and Lettering	C. E. 1, 2	..	1	1
Chemistry		4	4	4
Co-ordinate Geometry	Math. 10, 11	3	3	..
Calculus	Math. 21	..	..	3
Citizenship	Citizenship 1-3	4	4	4
Total		14	15	15

SECOND YEAR, TOTAL UNITS, 46

Subject	Course No.	Autumn	Winter	Spring
English Composition	Engl. 2a, 2b	3	..	3
Freehand Drawing	M. E. 11	3	..	..
Calculus	Math. 22, 23	3	3	..
Heat and Electricity	Physics 13,14	..	4	4
Mechanic Arts	M. E. 1, 2 or3	*..	2	2
Descriptive Geometry	M. E. 10	..	4	..
History		3	3	3
Extemporaneous Speaking	Engl. 7	3	..	..
Elementary Machine Drawing	M. E. 12	..	..	3
Total		15	16	15

THIRD YEAR, TOTAL UNITS, 45

Subject	Course No.	Autumn	Winter	Spring
Theoretical Mechanics	C. E. 30, 31	5	5	..
Hydraulics	C. E. 106	..	..	5
Surveying	C. E. 20	5	..	..
Engineering Geology	Geol. 1a	5	..	..
Electricity in Engineering	E. E. 102,103	..	3	3
Elementary Accounting	Econ. 3	..	5	..
Principles of Mining	M. & M. 101	..	..	5
Electives		..	2	2
Total		15	15	15

FOURTH YEAR, TOTAL UNITS, 45

Subject	Course No.	Autumn	Winter	Spring
Mechanics of Materials	C. E. 110	5	..	..
Pyrometallurgy of Iron and Steel	M. & M. 105	..	3	..
Exposition	Engl. 131	4	..	..
Business Law	Law 100	4	..	..
Prime Movers or Elementary Machine Design	M. E. 123		5 or	..
	M. E. 113	..	4	..
Engineering Economics	C. E. 130	..	..	3
Human Relations in Business		..	3	3
Electives		2	4 or 5	9
Total		15	15	15

*All these Mechanic Arts Courses are given in the Autumn, Winter and Spring Quarters. Any two courses may be chosen by the student, limited only by the capacity of the laboratories. Although scheduled for the Winter and Spring Quarters, sufficient registration is desired for the Autumn Quarter to make operation of all three laboratories possible.

**Since the presentation of this paper before the San Francisco Section, minor corrections have been made in this schedule to place it in complete accord with the curriculum appearing in the Stanford University Announcement of Courses for 1926-27.

gineer in the various branches. It is firmly believed that students who complete the six years will be very much better prepared for their life work than are those who take a more specialized course for four years and then one year of graduate work.

The question will often arise as to whether students who complete the four-year curriculum only will be prepared to begin work in certain engineering organizations. It is true that they will not be as well prepared in a certain few special phases of engineering as would the graduates of a more specialized curriculum. However, they will have a much wider range of choice, and need not feel limited to only a few specialties. If they devote their electives to carefully chosen courses, there need be no feeling that they are not prepared to become immediately useful. Future progress should be materially faster due to the broad foundation.

A few quotations from statements of leading executives and engineers will emphasize some of the statements made above.

SECRETARY OF COMMERCE HERBERT C. HOOVER[16]

"There is somewhere to be found a plan of individualism and associational activities that will preserve the initiative, the inventiveness, the individual, the character of man and yet will enable us to socially and economically synchronize this gigantic machine that we have built out of applied sciences. Now, there is no one who could make a better contribution to this than the engineer, but to make that contribution our engineers in the future have got to have a broader and stronger place in our world affairs than they have today. We cannot be turning men out of our universities as we are in many cases today purely mechanical machines devoted to some theory built on applied sciences. If the engineer is going to take his part in this community, is going to give expression to those things that he can express best, he must start with a sense of his public obligations as well as his professional knowledge."

* * * * * *

* * * "but we had better reduce the volume of science and applied science we are pouring into our young men in order to make room for some stimulation of their public relationships, some realization of their public obligations."

F. C. PRATT, VICE-PRES., GENERAL ELECTRIC CO.[17]

"Voicing my own opinion on this subject, we are not looking to the colleges and technical schools to turn out finished engineers, but we do look to them for a steadily increasing supply of young men who have been thoroughly trained in the fundamental theories of the mathematical and physical sciences, and to the fullest practicable extent in economics and in what are commonly called cultural studies. We believe that, with this ground-work thoroughly prepared, the large industries are in a particularly favorable position to offer exceptional opportunities to young men for gaining practical knowledge and experience along special lines.

"In this connection, I wish to make it quite clear that in the foregoing remarks I am not including those exceptional students who by natural qualifications and inclinations are prepared to pursue post graduate studies in theoretical work in any branch of science or engineering which contributes to the industry."

F. C. PRATT [18]

"My observations also lead me to the conclusion that the percentage of those who fail to attain a reasonable degree of success is greater in the group of men of mediocre ability but narrowly specialized education than in almost any other group coming within my knowledge."

PROFESSOR EDWARD BENNETT, UNIVERSITY OF WISCONSIN[19]

"One of the most gratifying developments of recent years has been the recognition on the part of the engineering industries that they do not wish to have the engineering colleges train men for immediate service in their specific fields."

DEAN F. L. BISHOP, UNIVERSITY OF PITTSBURGH[20]

"There are two factors which enter fundamentally into the life of an engineering student. One is education, the other is training. In the very early days of the engineering school, education was the controlling idea; later, training or specialization became the controlling factor. In other words, we shaped our courses, modified our curriculum, and selected our teachers with the sole purpose of graduating professionally trained engineers.

"The reaction soon became evident. The cry went up that the engineer, although thoroughly trained, was narrowly educated. He lacked the proper perspective of life. He was unable to grasp the economic principles underlying great problems. He was too intent upon design and the solution of specific problems.

* * * * * *

"We must look forward to the time when engineering schools will consider themselves as educating a large body of men who will become effective managers of the industries and who will exert, through their education and training, an important influence on the political and social side of the community.

"If our engineering schools will look upon the education and the training of this large mass of men as their primary object, and delay the specialization and technical training to additional years in the schools or industries, our instruction will be changed to meet this demand so that the emphasis will be placed more on education and less on specialization. Our teachers will not be such highly specialized technical experts but that they will be broadminded educators. The public will show an increasing confidence in our graduates because they will be educated as well as trained."

DR. F. B. JEWETT, VICE-PRES., AMERICAN TELEPHONE AHD TELEGRAPH COMPANY [21]

"Consequently I am interested in having those young men who come to us and who are going to be the leaders of our business of the future well grounded in the sciences. First, because we need them in the technical side of our business, and second, because I believe we are going to need them in a larger measure as the recruiting source for the executive directors of our business in years to come."

JOHN MILLS, DIRECTOR OF PUBLICATION, BELL TELEPHONE LABORATORIES, INC.[22]

"After we have answered these intermediate questions, we shall probably agree that we turn to the colleges in the hope of obtaining men of good mental ability and personality, who have acquired habits of thought and study which will enable them to see broadly the business and technical problems of the future, to analyze the factors involved, to arrive objectively and without prejudice at solutions, and, through personality and executive ability give to those solutions weight and effectiveness. We look, I believe, for trained brains in vigorous bodies with pleasant but dynamic

personalities; men who may make creative contributions to our respective businesses or arts and, in a sufficient number of cases, develop as capable executives."

DR. M. I. PUPIN, PRESIDENT, A. I. E. E.[23]

"Nothing resists a change so obstinately as the mental attitude of man. The history of science from Archimedes to Newton offers many illustrations of this well-known fact. The change in the mental attitude of our age is one of the greatest achievements of our intellectual renaissance. Less than two generations ago, educational training was expected by many to operate like a penny-in-the-slot machine; that is, learn your lesson and convert your learning into cash without much delay. The so-called practical man who managed our American industries was at that time an ardent advocate of this utilitarian theory. He worshipped the art of making a living. Franklin and Lincoln, my patron saints, had no sympathy with this theory. The art of making a living was not the determining factor in their schooling, but the art of making life worth living was everything to them. They would find no fault with the American college because its diploma does not testify that college graduates are loaded with a knowledge of the art of making a living, provided, however, that they carry with them some definite ideas about the art of making life worth living, not only their own individual life, but also the life of our nation. The expansion of these ideas is the gospel of the American university."

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[Continued on page 42]

Who's Who in Eta Kappa Nu

The extreme modesty of our brothers prevents us from printing the usual Who's Who in this issue. A number of brothers, selected as prospects for this page, all failed to supply Brother Lamont with the necessary information.

We hope that we will be able to persuade at least one brother to come across in time for the January BRIDGE. For the benefit of our new readers, we are printing below an index to the Who's Who articles already published:

INDEX TO WHO'S WHO PUBLISHED

C. O. BICKELHAUPT, T '11	Vol. 20, No. 1—Nov. 1923	L. F. FULLER, K '12.....	Vol. 21, No. 2—Jan. 1925
B. T. ANDERSON, A '07....	" 2—Jan. 1924	G. W. SAATHOFF, A '06...	" 2—Jan. 1925
J. L. STAIR, A '08.....	" 2—Jan. 1924	F. R. WINDERS, A '05....	" 4—May 1925
M. L. CARR, A '05.....	" 3—Mar. 1924	L. F. WOOSTER, A '06....	Vol. 22, No. 1—Nov. 1925
R. E. DOHERTY, A '09....	" 4—May 1924	L. T. GARRISON, A '07...	" 2—Jan. 1926
W. A. KIETZMAN, T '12...	Vol. 21, No. 1—Nov. 1924	H. C. DEAN, A '09.....	" 3—Mar. 1926

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The BRIDGE OF Eta Kappa Nu

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N. S. Hibshman, M. C. Hale and F. E. Brooks at the Installation of Chi Chapter.

OUR NEW VICE PRESIDENTS

Two new faces appear on the National Executive Council as the fraternity gets ready for business this fall. Brother Merle C. Hale, T '14, the new second Vice-President was elected at the convention in Lafayette last year and took office on July 1st.

Brother Hale's duties, as provided for in the Constitution, are the stimulation of alumni activities. Alumni secretaries should keep him posted of the doings in their chapters. One easy way is to send him notices of all meetings. Communications to the Council regarding alumni matters should be sent to him at 195 Broadway, New York City. Brother Hale, although new as a national officer, has been active in Eta Kappa Nu affairs in New York City for a long time. He is a past president of N. Y. Alumni Chapter and has done a great deal of work in connection with the publishing of The Bridge. His daily work is in the commercial department of the A. T. & T. Co.

Schenectady, Eta Kappa Nu and Sammy Lee have long been synonymous. Brother Lee has been the guiding spirit of Schenectady Alumni Chapter for so long that the writer cannot remember the beginning. Last year his efforts to establish a chapter at Union College were rewarded with the chartering of Phi Chapter. When Brother Knight resigned as First Vice-President Brother E. S. Lee, A '13, was the logical appointment by the N. E. C. to fill the unexpired term. Brother Lee is in charge of one branch of the General Engineering Laboratory of the G. E. Co.

The two new Vice-Presidents are staunch believers in Eta Kappa Nu and hard workers. The future of H K N is in safe hands for the next few years. The Bridge wishes them both most successful administrations.

PROMISES MADE AND FULFILLED

Two promises made in the May issue we have fulfilled. Mr. Royal J. Davis, of the *New York Evening Post*, and an authority on books, presents seventy-five titles in his article in this issue. How many of these books have you read? If you do not read all of these, consult this list the next time you say to yourself, "What book shall I read?"

The other story which we promised is the Biography of Michael Faraday. Brother Newlund has written a most entertaining account of the life of a man whose name is known to all electrical engineers, but whose life is usually a closed book to them. After reading this excellent introduction to a more detailed study of his life get a copy of his "Experimental Researches". You will find it very interesting.

Only very occasionally are we able to arouse any discussion over the articles which appear in The Bridge. Brother Lamont's article on "Some of the Disadvantages of the Big Company" apparently accomplished this. We wish, however, to make our position clear. The Bridge holds no brief for either the small company or the big one. During the past several years, a number of articles have appeared in our pages about the advantages of the big company. Brother Lamont's article was a glimpse at the other side of the picture. Brother Smith's article in this issue is a very complete review of the case for the big company. We are trying to present all the information obtainable on the subject for the benefit of the active brothers in school who have their decisions yet to make.

It is interesting to note that C. R. Hanna, who is featured in the Westinghouse advertisement on the back cover of this issue, is a B '22 brother.

Active Chapters

Alpha Chapter

University of Illinois

Alpha Chapter is starting out the year of 1926-27 with thirteen men and this number will soon be increased for the pledging of new men will soon take place. From all indications the Junior Class this year is going to produce some good men for there seems to be things doing around the Lab. where the juniors work. These new pledges will help carry on the organization of Alpha Chapter. At a meeting just before school closed in the spring the following men were elected to office:

President, J. O. Ephgrave; Vice-President, J. F. Jirousek; Treasurer, J. E. Baudino; Recording Secretary, C. G. Ketel; Corresponding Secretary, H. E. Keneipp; Sergeant-at-Arms, G. S. Peterson; Associate Editor, R. E. Morrison.

Most of the Brothers were out in the electrical or mechanical industries this summer. Brother Baudino showed Westinghouse what a real Illinois engineer was like. Later in the summer he went to Nela Park at Cleveland along with Brother Crossett.

Several other of the Brothers kept the Bell telephones going in Chicago. Brother Ephgrave worked as an equipment engineer out of the Calumet office; Brother Keneipp repaired phones for the Edgewater subscribers, while Brother Morrison kept the machine-switching apparatus in the State-Central office in good working order.

There were several other of the Brothers working near Chicago. Brother Thoma was at Hammond, Indiana, as an electrician and blacksmith's helper for the Union Metal Products Co., while Brother Pritchard worked at almost the same task—that of electrician and helper at the Hillside Fluorspar and Lead Mine at Rosiclair. He reported that most of his work was done in keeping out of sight (under ground.)

Summer school held the attention of Brother Jirousek at Crane College and Brother Crossett at Illinois. Brother Soliday spent a good part of the summer at Fort Sheridan learning all about army life. It was great, he said.

Radio work claimed the attention of Brother Frank, for he helped build sets. Almost in the same line was Brother Ketel, who worked in a machine shop in the city of Chicago.

That leaves the two farmers to be accounted for. Brother Peterson carried the mail in his home town of Lindsey, Nebraska, between the times he was cultivating his land. Brother Robbins, way out in Manhattan, Kansas, showed the natives how to run a threshing machine in good style.

That's all for the active members, so now for a little news of two of last year's grads. Brother Phil. Emley married a girl in Danville this summer, while Brother E. M. Sobota decided that he wasn't going to stay alone in the world, so he took a bride, Miss Stork, from Chicago. Congratulations and best wishes.

Alpha Chapter wishes to extend to the others in Eta Kappa Nu its greetings and best wishes for a fine year. May you all have a profitable school year and when the times comes to graduate you will feel well able to go out into the world.

RAY E. MORRISON,
Associate Editor.

Beta Chapter

Purdue University

Beta Chapter begins the new school year with 14 active members. Fall pledging has not yet taken place, but will probably occur in about two weeks. The chapter consists at present of G. A. Caldwell, V. E. Cooper, D. D. Douglass, V. A. Douglas, D. P. Dumont, L. J. Dunnewold, O. D. Grismore, J. G. Harden, T. B. Holliday, A. Howard, M. L. Mount, H. W. Pittenger, E. C. Rearick, K. M. White.

This fall sees the School of Electrical Engineering completely housed in the new Electrical Building. The second unit of the building was completed this summer and all class rooms and labratories are now located here. The old building is now known as the Engineering Administration Building, and contains the office of the Dean of Engineering and the Personnel Offices.

Enrollment was unusually large this year, reaching a total of 3500 students, the largest number ever enrolled here. The School of Electrical Engineering has an enrollment of 809 students. This is undoubtedly an unusual year for the University, and we are confident that the Junior Class contains material that will make it an unusually successful year for the chapter.

O. D. GRISMORE,
Associate Editor.

Gamma Chapter

Ohio State University

Last spring quarter was finished with a rush, undergrads digging for exams and Seniors trying to decide which job looked most attractive. Breaking into the feverish work at pleasant intervals however were picnics, dinner meetings and then finally Engineers' Day. This major event of the Engineering College occurs but once in two years, and is an Engineering Exposition, being complete with examples of engineering work and apparatus, set up and operated by the students, as well as exhibits brought by manufacturing companies. It was generally agreed that the Electrical Exhibit was superior to that of any other department, and in recognition of the fact a silver loving cup was presented to the president of the S. A. I. E. E., Brother Lee P. Doyle, by the Engineers' Council. Most of the leaders in the preparation of the Electrical Exhibit were Eta Kappa Nu men. The S. A. I. E. E. has been called the "ideal student organization," due in a great measure to the work and leadership of Eta Kappa Nu men, who support it to a man.

The chapter decided that as a relief from the routine of business meetings, in order to explore the beauties of nature and last, but not least, to get their friends, the co-eds, together, they would have a picnic. This was most effectively done and the result was most pleasing. The chapter met at a picnic grounds about fifteen miles from town, where they found that the technicalities of rowing a boat could be learned in less than one evening. At dusk a large fire was lighted and steaks and weiners broiled, pickle bottles and other duties attended to with skill and dispatch. Professor and Mrs. Caldwell and Professor and Mrs. Puchstein were the guests of the chapter and acted as chaperones. Everyone agreed that the party was a huge success.

Several dinner meetings were held for business purposes before the quarter was officially closed with a set of nice, hot exams.

The first business meeting of this quarter is to be held soon, at which plans for the fall social activities, grade investigation and other matters of importance will be discussed.

Two Eta Kappa Nu men who graduated last year, finding that there is still a roughness of finish on their mental equipment, have decided to return for the purpose of securing a master's degree. They are Brother H. G. Rawlins and Brother Willard E. Singer.

Eta Kappa Nu will this year have men on the Engineers' Council. Boost Ohio, as well as several members of Tau Beta Pi, Texnikoi and the S. A. I. E. E., of which Brother Lee P. Doyle, '27, is president.

W. GLENN HARDY,
Associate Editor.

Delta Chapter

Armour Institute of Technology

On Sept. 20 the doors of A. I. T. were swung open to the Freshman. The next day the Sophs, Juniors and Seniors stepped inside the portals to declare that they were ready for the oncoming year. Eight of the active H K N men were there with their hearty handclasp.....in fact some of them were too "dern" hearty. Well, we were all glad to see one another again and that was the best way we could express our feelings.

We have had three business meetings, all of which have been lively and interesting.

Brother Burcky held an en-"lighting" position this summer at the Randolph Sub of the Commonwealth Edison Co., while Bros. Waehner and Swanson kept busy at the McCormick Works of the International Harvester Co. Brother Brightman "broke" himself after a vacation of two weeks at Ashland, Ill. Probably that demon Golf brought about the foregoing condition.

At home we found Brother Goetz getting his much needed rest after the trials of being the editor of the A. I. T. annual. Brothers Ewald and Burkhardt spent part of their summer in Michigan. After working for the Illinois Bell Telephone Co., Brother Schramm went up to Wisconsin to try his luck at that grand old game of golf.

October 6 was the night of the "Freshman Handshake." Brother Burcky was in charge. About half of the student body turned out for this event....it was a record crowd. The basket-ball game between the Sophs and Juniors was well contested and the "refreshments"—coffee and "sinkers," were excellent. We were surprised to see Brothers LeCren and McHenry of '26 at this gathering. They had a great deal to tell us about their 10,000 mile auto tour along the western coast.

Dean Monin was greeted royally after his return from his trip abroad. The ovation he received from the Seniors in Philosophy was tremendous. Needless to say he was just as happy to see "his boys" again.

Last May at the A. I. E. E. election all three of the offices were filled by HKN men. Delta Chapter takes pride in this responsibility.

This year Delta Chapter had another one of its members chosen for a position on the Faculty of A. I. T., Brother Hansen, '26, is the man and he is instructor in mathematics. Brother Hansen, Delta Chapter wishes you all the best of luck in your new position.

KARL J. BURKHARDT,
Associate Editor.

Epsilon Chapter

Pennsylvania State College

With the opening of college Epsilon Chapter is very busy. To make the E. E. Society of the school bigger and better known than ever, around the campus, the brothers of the Eta Kappa Nu have assumed the leadership of that organization and are trying to make it the most popular society on the campus. Much attention is also directed toward the persuading of men to join the student branch of the A. I. E. E. Heretofore "State" ranked fourteenth among other colleges in membership of this organization, but we are sure that with a little work we can make our Alma Mater rank amor the first. Brother Professor Doggett is the head director of operations and under his guidance things are progressing very rapidly. Brother Wilkins is the president of the E. E. Society.

Besides being interested in the college affairs, Epsilon Chapter is also busied in making ready to take in new pledges. The new men have not been elected as yet but we expect to have them pledged within the next three or four weeks. The college list of relative class standing has not been published for last semester, this being the cause of our delay.

The approach of Alumni Home-coming Day, October the 23rd, another big job faces us all. It is customary that a big electrical display is staged annually in the dynamo laboratory. This display has numerous marvels and so-called miracles and is undoubtedly the biggest attraction for the returning alumni. They never fail to spend a few hours viewing this display and discussing the weird phenomena. This year's show is expected to be better than ever before. The Physics department has offered to exhibit their latest electrical discoveries. Our Physics department has been exceedingly active in the past few years; contributing to science many new discoveries.

Professor Doggett is carrying on his research work on form factor which he started last year and at that time an article on this subject appeared in the A. I. E. E. Journal. He is assisted in his work by Brother Huggler.

In closing, Epsilon wishes to extend her congratulations and best wishes to her neighbor chapter, Chi, at Lehigh University, Bethlehem, Pa.

GERARD A. ALBERT,
Associate Editor.

Zeta Chapter

Case School of Applied Science

When school started this year we found that all of the brothers of the class of '27 had returned ready for their last year of college. We have a chapter of eleven actives to start the term and are planning the election of pledges.

We have the following information concerning a few of last year's graduates: Brother Randall is with the Western Union Telegraph Co. at New York; Brother Rudd is with the American Telephone and Telegraph Co.; Brother Eisenman is with The Reliance Electric and Mfg. Co. at Cleveland; Brother Ptacek is with The Ohio Bell Telephone Co., at Cleveland.

The following officers were elected at our first meeting this term: President, J. L. Whiteman; Vice-President, R. J. Kappanadze; Recording Secretary, J. R. Kelch; Corresponding Secretary, C. J. Brumbaugh; Associate BRIDGE Editor, J. P. Ditchman, 6902 Zoeter Avenue, Cleveland, O.; Treasurer, J. C. Erickson.

Our campus has been the scene of great activity during the summer months. Our new mechanical building is nearing completion and is going to be quite an addition to the present lay-out of buildings. A new eight foot concrete walk extending nearly the full length of the campus will remedy the congestion between classes experienced in previous years. In connection with the new building will be the school power plant consisting of boilers and a turbine-alternator. The distribution system will be 2300 volt, 3 phase, 60 cycle. All conductors are to be under ground. For direct current power in the electricity laboratories, a motor-generator set will be employed, using a 2300 volt synchronous motor driving two 110 volt direct current generators. These two generators are to be connected in series, providing a 220-110 volt system. All these improvements will be completed about December first.

Brother Ditchman is making a name for himself on the team this season, having won a permanent position as quarterback. Joe is the smallest player on the varsity squad but his size seems to be an asset rather than a detriment. Our team has been a winning one so far this season and we are hoping that it will continue to win. Joe is a real player and Zeta is proud of him.

L. B. CROSBY,
Associate Editor.

Theta Chapter

University of Wisconsin

The last lap of our collegiate career has begun and with a little luck we may cross the finish line this June. All of the brothers of the class of '27 have returned from a summer season of labor—physical, mental or otherwise.

Gerks and Teare were in the wilds of Canada trying to find mounds of ore where only stone appeared. Millermaster, Thayer and Lillquist are now eminent authorities on lighting in all its phases after their trip to Nela Park. Post and Murray got a jump ahead of the rest by attending summer school here. Davis set several poles for the Wisconsin Telephone Company and Erickson worked on the other end of the line at the Bell laboratories. Carpenter took the trip to Nela Park and still found time to work for the Wisconsin Power and Light Company.

A number of the old-timers have decided to return for work in the graduate school. Mathias, Hebard and Benedict should be able to enliven our meetings. We would enjoy hearing from other members of the class of '26, if they can spare the time from their arduous duties.

We are at present greatly perplexed with the problem of choosing an inspection trip that will meet our desires and at the same time stay within the boundaries of our finances. Whatever our decision we hope to see some of our alumni members in our travels.

R. J. DAVIS,
Associate Editor.

Iota Chapter

University of Missouri

Iota has 11 men back this fall, and the first meeting began the year with 100% attendance. All the newly elected officers returned with one exception, Earl T. Andes, our Secretary, who failed to show up. We hope he will be able to return next semester. Brother William G. Davis was elected to fill the vacancy.

Our chapter is busy preparing for the convention which we are honored in having at Missouri, November 5 and 6, this year. We are going to celebrate by skimming the cream off the Missouri electricals of '28 for our increased membership. We have watched them two years, so we are sure of ourselves and the whole H. K. N. convention will O. K. our choice when they become acquainted with them. Iota is going to do her best to make the entainment as royal as possible for the "conventioneers."

Eta Kappa Nu at Missouri is ranking higher each year. The number of electricals makes it possible to set our standards higher and more and more are we letting the Dean know that Iota means business in the class room as well as in the other activity around the campus.

Iota has her hand well forward in the work for 1926-27. Our own Brother McCune is our Engineers' Club president, winning the election from Brother Minnick by a few right hands (and a few lefts). Brother Cunningham is our club treasurer and Brother "Bill" Gum heads the all active St. Paul's Board as their president. Other Iota men are on the Shamrock staff working for a bigger and better engineers' annual, while others are out each day before and after classes fighting the world for the shekels that keep them in school. Altogether, we have a fine active chapter and the world can expect big things of us.

Our alumni members will be glad to hear of our good fortune in having our Honorary Brother Lanier back to teach us again. He has just returned from a year's study and travel and Iota congratulates herself on having access to his counsel for the ensuing year.

We would like to hear from some of the new alumni as well as the old ones from Iota. Write us a letter, and we will assure you that never would there be a letter more appreciated nor more quickly answered.

RAYMOND C. HASE,
Associate Editor.

Kappa Chapter

Cornell University

Kappa chapter held the first meeting of the 1926-27 season on October 8. The membership has of course been considerably reduced by the June graduation, but all of the 1927 men are back to give the chapter a good foundation for the coming year. A committee has been appointed to look up the eligible juniors, so that we may be sure of recruiting the type which the society desires.

Last year we tried the experiment of having nearly all of our meetings dinner meeting preceded by a short business session. This system was a success. It promotes good fellowship between the faculty and undergraduate elements; and helps us to avoid the cut and dried strictly business meetings in which no one takes any pleasure.

All and all last year was a very successful one for Eta Kappa Nu at Cornell, and we anticipate one of the same sort this year. We feel sure that the other chapters will have the same happy expectations.

Donnell D. MacCarthy
Associate Bridge Editor.

Lambda Chapter

University of Pennsylvania

The new year is under way with all the active members back. There are five of us: Robert Glover, Walter Fulton, Charles Oler, Richard Koms, and Wm. F. Satterthwaite.

The summer was spent pleasantly by each one and the work was diverse. Brother Glover was employed by the Fraser-Brace Construction Company. He was in charge of the placing of two thousand tons of reenforcing steel in a large Hydro-Electric development in Chelsea Falls, Canada. It was a lonely country but the work took all his time and energy. Lucky, wasn't he?

Brother Oler spent his summer here. He was allowed to work in the new Moore school building which is being made over from a small factory. He did some drafting work and their switchboard work. He has done some "Moore" work.

Brother Fulton completed his third summer with the Pennsylvania Railroad as a Passenger Train Brakeman. He did his work so well that he got a free ride to and from Niagara Falls. He says they are really very large falls with lots of water coming over!

Brother Koms had the best summer. That is true, as far as opportunities are concerned. He spent his hot days playing in an orchestra and traveling. He played on the Cunard Liner, "Franconia." He visited Liverpool and London but no jobs were available due to the union strike. At Ostende, Belgium, the Orchestra played at "Chez Pan Cafe" for the "Venus Revels," straight from Paris! From Paris, anyway. Next point was Brussels whence the group flew to Cologne. Then a trip up the Rhine (by boat) to Mainz. From there to Luzerne and Interlaken. France was the next place blessed. They saw Paris, "Doughville" and soon after saw Le Havre and embarked. The Orchestra played on the Cunard Liner "Coronia" coming back. Thus their ocean fare was earned! What a soft job he had!

Brother Satterthwaite spent the summer inspecting Concrete Road Construction for the State of Pennsylvania. He was in the mountainous district right among soft coal mines and miners. They are an interesting lot of people, but don't get them mad at you!

The new Moore School Building is still under construction, so occasionally some of the Brothers may be seen in old and dirty clothes. But that does them no harm. The building is two stories high, of brick and stone, and is next to the Engineering Building of the University where we are now quartered.

Brothers Estrada and Talley of the class of 1926 are back for a year's graduate work. They received fellowships and are studying for their Master's Degrees. This is a new course in the school and it has some fine men to start with.

We all hope for a very good year and send best wishes to all our Brothers.

WM. F. SATTERTHWAITE,
Associate Editor.

Mu Chapter

University of California

Our chapter has gotten off to a fine start, and the coming semester promises to be one of the best that we have so far enjoyed. Several of the members this year, have been active for more than a year, and when it comes to running an organization such as ours, their presence is a great advantage.

The important business of the chapter so far has been, of course, the coming initiation. We are taking in the following men: Seniors, A. B. McGlade, N. R. Wilson, W. C. Hodgkins, N. Fossati, and J. P. Burkhart. Juniors: H. R. Lubke.

As regards the initiation itself, we intend to have much the same program as last year, that is to say, no public initiation. In the past years, it was the custom to send the men around the campus with a heavy hammer and a suitcase full of iron in their hands and any other little hindrances which might seem fitting at the time. The general opinion is, however, that this type of initiation simply cheapens the affair, and so it has been eliminated.

The formal initiation is to be held in San Francisco at the same place as the banquet. From all indications we are going to have a record attendance, and the affair will certainly be a success. We are all looking forward to seeing the members who were with us last year and all those others who may come back to see how their old classmates are getting along.

Speaking for all the members, I would certainly appreciate any news from our alumni, and any suggestions which they might have to offer.

FRANCIS K. MCCUNE,
Associate Editor.

Nu Chapter

Iowa State College

Things at Nu Chapter are rapidly getting under way, although due to unusually late opening at Iowa State this fall, registration and fraternity rushing are hardly yet out of our minds. Six men were initiated into the ranks of Eta Kappa Nu at the end of the Spring quarter last year. These men were Charlie Meyers, Philip Konkle, Wesley Gregory, David Gearhart, Russel Free and Ivan Appelgate. In addition to these men the following old men are in school this year: Alfred Baumgartner, Clifford Faust, Herald Heywood, George Kendall, Joseph Umhoefer and Claude McBroom.

Registration in electrical engineering is the largest this year in the history of the department here. All of the plans for the annual Engineering Campfire which is to be held October 15th are now under way. This event consists of a carnival and campus talent vaudeville show and is one of the stellar attractions of the fall quarter. All of the members of Nu chapter join in wishing a successful year to the Brothers in the other chapters.

DAVID B. GEARHART,
Associate Editor.

Xi Chapter

Alabama Polytechnic Institute

All of the nine members elected to Xi Chapter last spring have returned to school this fall. These, together with the four men recently elected from the senior class, are making plans for the chapter to do something during the coming year besides electing new members.

Among the things planned thus far is a hike for the members of the junior electrical engineering class to be given in December. This hike will take in a large substation located near the college. It is thought that aside from the benefit the juniors will derive from the trip the members of the chapter will have an opportunity to meet and become more familiar with the men in the junior class. In this way a wiser selection will be possible in the coming spring election.

Xi Chapter has also planned an electrical show to be given in February or March of next year. The purpose of the show will be to increase the interest and esteem of the underclassmen for Eta Kappa Nu.

The chapter has made an excellent beginning for the new year, and the members are looking forward to a very successful year.

J. M. Edwards,
Associate Editor

Omicron Chapter

University of Minnesota

The spring quarter was a season of varied activities for the members of Omicron Chapter of Eta Kappa Nu. In May six men were brought into our midst by the spring initiation. After the initiation a dinner for the initiates was given at the Nicollet Hotel in conjunction with Pi Tau Sigma, honorary mechanical fraternity and Chi Epsilon, honorary civil fraternity. This was carried out with such success that it is expected that many more initiation dinners will be held in this manner.

The six men initiated were: Lloyd V. Berkner, Edward L. Bottemiller, Chas. H. Burmeister, Robert F. Edgar, Albert C. Lee, H. Barrett Rogers.

As is the custom at Omicron a steak roast was held in honor of the graduating brothers, on the banks of the Minnesota river. The arrangement committee informed us that we were to have one-half mile of paddling before reaching the scene but the condition of the paddlers who informed the professors the next day that they were unable to write would have led one to believe that it was nearer ten miles than one-half a mile. However a "roasting" good time was had by everyone.

Members of the Electrical Engineering Department as a whole and the brothers of Omicron Chapter in particular were shocked to read in the morning papers of May 29 of the death of Professor George D. Shepardson, which occurred at Florence, Italy, on May 26 while traveling with Mrs. Shepardson and daughter. Professor Shepardson has been head of the Electrical Engineering Department at the University of Minnesota since 1891. During a greater part of this time he has been active in Omicron Chapter affairs and the loss is greatly felt by the brothers.

We are very fortunate this fall in having all the Juniors from last year return to school so we are fast getting under way again. The active membership at present totals ten men, which we expect will soon be augmented by incoming neophytes.

Omicron Chapter extends its greetings to all the brothers and best wishes for a prosperous and successful year for all the Chapters of Eta Kappa Nu.

CHAS. H. BURMEISTER,
Associate Editor.

PI CHAPTER ON ITS ANNUAL TRIP TO MARY'S PEAK

Pi Chapter

Oregon Agricultural College

As the rush of the fall term registration is now over the brothers are settling down to some hard study interspersed with a few football games.

Last term Pi Chapter held its annual Mary's Peak trip and initiated: Senior—Ernest A. Howard; Juniors—Carl G. Archibald, Walter H. Russell, Edwin B. Torvik, Virgil E. Woodcock.

I am sending a snapshot that Brother Garman took on the trip. This was perhaps one of the most enjoyable parts of the trip, although our new brothers might disagree with me. The return trip was made in a drizzling rain, but this did not in the least dampen our enthusiasm. All the brothers who took the trip are looking forward to another one this year.

At the last of the spring term the chapter held a banquet in honor of the departing Seniors. One of the most interesting talks was given by Brother Wooster, A '06, on the early history of Eta Kappa Nu.

In the latter part of the spring term the loving cup, awarded by the chapter to the most deserving Sophomore in Electrical Engineering, was presented to Richard C. Setterstrom.

Most of this letter has been ancient history, but the chapter letter was not in the last issue of THE BRIDGE. Pi

Chapter extends greetings to all active and alumni brothers of Eta Kappa Nu.

VENE E. RINEHART,
Associate Editor.

Rho Chapter

University of Colorado

As we, the flock of green and quite untried Associate BRIDGE Editors, make our timid debut before the inquiring gaze of at least our own alumni and a few proof readers, it is no wonder that we have the uncomfortable feeling of being not quite fully clad. However, from the appearance of this page, no one would guess that we are timid.

Grads of last year, you who initiated us into the sacred rites of Eta Kappa Nu, Rho chapter is missing you on the campus this year. We envy you, of course—mainly because of the intricacy of some of these A. C. Problems. But you would enjoy being back for a while. The Campus is gorgeous with color; trees that are vivid flames of autumn reds and yellows; new white snow back on the range; green on the campus, not only of caps.

The year has begun very auspiciously. The "Engine School" counted an increase of nearly five per cent. There was much enthusiasm at Rho Chapter's first meeting, when plans for the year were outlined. Brother Smith, president of Rho Chapter, will represent the chapter at the National convention. Smith has just finished an arduous summer with the Great Western Sugar Company, and certainly deserves a vacation. Sid had a "half-time" job, eighty-four hours per week installing electric machinery.

This chapter is doing its share in campus activities. It is significant that for the last two years the editor of the Colorado Engineer has been a member of Eta Kappa Nu. Last year both editor and manager, as well as others of the staff of the Engineer were members of the fraternity, and this year the enterprising editor of the magazine is Almon D. Thomas, Rho '27.

In closing, we of Rho Chapter would like to express our interest in and best wishes for all our brothers in Eta Kappa Nu.

E. MILTON BOONE,
Associate Editor.

Sigma Chapter

Carnegie Institute of Technology

Biff! Bang! That's alright, don't get excited, it's only Sigma Chapter throwing in the breakers to begin the year's activity in HKN. We only have six active members with which to start the new year, but a few men with a little inspiration and a lot of perspiration can accomplish big things. Between our first A. C. Machinery and High Frequency problems it looks as though somebody is trying to dampen our ardor but in spite of them we are getting started in great shape. It happens that our Senior class is the first to schedule the new high frequency phenomena course and to get the use of new laboratory equipment for studying telephone phenomena on lines from 25 to 200 miles in length. The effect of the long lines is gained by the insertion of reactances and capacitances in the circuit by cleverly designed switching arrangement.

As far as offices are concerned nobody had a kick coming as there are just six of them and just six of us to fill them. The selections for the offices are: R. W. Hurd, President; F. A. Kolb, Vice-President; R. M. Pew, Secretary; J. R. Power, Corresponding Secretary; P. M. Williams, Treasurer; and J. T. Chidester, Associate BRIDGE Editor. Getting acquainted with the duties of our offices is about over with and we hope soon to devote our energies to promoting the welfare of HKN.

A few words now concerning our activities last spring just before the close of the school year. The Electrical Smoker held under the auspices of Eta Kappa Nu was a complete success in every way. There were several members of the Pittsburgh Alumni Chaptr present and you may ask them if they didn't learn some new things about running motor tests! The tests were actually run off without blowing the main circuit breakers in the power house!

Complete charge of all electrical work for the Annual Campus Week celebration and permanent control of electrical equipment for all student events was given the chapter by the Student Council. For Campus Week a number of unique lighting effects were used, among which was the lighting of a dragon at the entrance of the campus to represent fire issuing from the nostrils and mouth. The campus as a whole was lighted with Japanese lanterns to fit in with the general decoration scheme.

JOHN T. CHIDESTER,
Associate Editor.

Tau Chapter

University of Cincinnati

This year marks an epoch in the history of electrical engineering at the University of Cincinnati as the new Electrical Building, Swift Hall, named in honor of the man whose generosity helped to make the new Electrical Building possible, has been completed and is now being used. The Electrical Department while not yet fully acclimated to the new, finer and more expansive surroundings of Swift Hall is preparing to utilize the modern laboratories, equipment and class rooms of the building to the fullest extent with the ultimate aim of making the students realize that the statement "Real progress comes from the pursuit of knowledge for its own sake," is something more than just a part of a dedicatorial tablet placed in the entrance of the building. The only regret of the actives of Tau Chapter is that they have not been permitted to spend their full school period in this building.

The traditional habit of handing the work of the chapter on to another set of well selected men who, the present members feel confident, will carry on the work and ideals is being considered with the necessary investigations at Tau so that those selected will have time to get acquainted with the work before it is necessary for the present actives to leave. While the junior class is not large at Cincinnati, we feel certain that we will have no difficulty in selecting competent successors.

The social season of 1926-27 was opened by a most pleasant party at the country home of Brother Joe Noertker at Terrace Park, Sept. 18, which was attended by a large number of Alumni, actives, with their wives, and lady friends living in Cincinnati. The afternoon was spent in various deversified sports as golf, pitching horseshoes, toy balloon races and treasure hunts. The pitching of horseshoes probably brought back pleasant memories to some of the alumni present as it was and still is one of the hobbies of many of the students of the Engineering College of U. C. After dinner under the trellises of Brother Noertker's garden the evening was spent toasting marshmallows and indulging in reminiscences about a large bon-fire. The affair will help to strengthen the Alumnus Chapter which is being formed here.

The Tau Chapter sends greetings to all brothers in Eta Kappa Nu.

O. E. PIENKOWSKI,
Associate Editor.

Upsilon Chapter

University of Southern California

Southern California is opening the fall term with eight H. K. N.'s entering their fourth year of campus life. At the close of the spring semester of '26 we had nine, and like the 'Ten Little Indians' song, "Now we have eight." Fred Betke went to Michigan and failed to return for this semester. Our activities closed for '26 by presenting Professor Biegler with an Honorary Membership. Six men, H. J. Summers, J. Hunter Clark, Lloyd Hunt, Robert E. Rowley, Edward Heath and Carlton Black were admitted as Associate members. These six men are former graduates of Southern California, and are all well known business men in the Southern section of California.

A banquet, with a large attendance of Los Angeles Alumni present, capped the '26 activities. The officers of '27 were presented at this time, with A. M. Walker, President, Ted Blakeslee, Vice President, A. F. Betke, Recording Secretary, Lester Weisser, Treasurer, Joseph Harry, Corresponding Secretary, and Willard Bausman, BRIDGE Editor.

The fall term opened with Freshman week. This class of Freshman is the largest that ever entered the Electrical Department. Walker, Raife, Weisser and Bausman aided Professor Biegler in advising the freshmen in arranging their courses, and at the same time, explained the organizations and fraternities in the engineering departments. Several high school track, football and scholastic stars were discovered in registering.

Our first meeting, Sept. 21, opened at the home of President Walker. Many plans were discussed, that seem to bid fair in equaling the record of '26.

Most of the meetings are to be at the homes of the members. It is hoped this will bring closer friendship between the members.

Another plan is to send letters, now and then, to the graduates, so they will know the work carried on by the chapter. The chapter in turn will be benefited by the advice of the experienced men.

Professor Biegler told of his trip to the Western Electric Co. at Hawthorne, Ill. He visited several Universities and many friends. He told us of his good visit with President Hofgren.

The second meeting was called at the home of Karl Raife at 6 p. m. on the 28th. A delightful meal preceded the meeting.

The eligible pledges were discussed at the meeting, and those with good standing were passed to the scholarship committee for rating.

Upsilon is to present an Electrical Engineers Handbook to the Freshman each year with the highest record. The chapter hopes this will encourage good scholarship records.

Just before the close of the meeting, we had a truth confab. Each one was criticized for his qualities. This is done in a friendly, helpful spirit, and intended to let each one see himself as others see him.

All of the class of '26 have gone back this fall to General Electric or Westinghouse Companies. Upsilon now writes Mr. and Mrs. to Chester Little and expect to do same to Paul Churchill around Xmas.

Professor Guse, U '25, is now with the General Petroleum Co. in the laboratory of one of the plants.

WILLARD BAUSMAN,
Associate Editor.

Phi Chapter

Union College

Phi Chapter takes this opportunity to greet all Active Brothers of H. K. N. and wish them success for the year to come.

Seven of the former juniors, elected last spring are back to give Eta Kappa Nu one of its best years at Union. We regret to state that Philip Bevans Kyle of Bethel, Conn., was fatally injured in an automobile accident and died on May ninth, 1926. We will feel the loss of Phil greatly as he was one of the leading men of our organization and candidate for President for the coming year. It was a pleasure to associate with him and his pleasing, affable manner won him friends on all sides.

The first business meeting of the year was rather an informal affair held in the Kappa Alpha Lodge. We elected a representative to the convention and the President appointed a committee to select men whom they thought might be good prospects for Eta Kappa Nu.

James R. Simpson was elected as our representative to the convention and we all feel that we have made a wise choice. Rip, as he is known to us, comes from Liberty, N. Y., and is a member of the Delta Upsilon fraternity. He has been associated with the Concordiensis, the college paper, and the musical clubs, having traveled with the clubs in their tours over New York State. He was a member of the college quartet last year, and he is also a member of the interfraternity council. Rip is also on the fencing squad, but he doesn't like this to be known. We suspect he is practicing so as to be able to challenge someone to a duel.

The elections held last spring were too late to be published in the last issue of THE BRIDGE. The new officers are as follows:

D. H. Burr, President; J. R. Simpson, Vice-President; W. G. Hampton, Recording Secretary; F. J. Powers, Treasurer; H. T. Maser, Corresponding Secretary and BRIDGE Editor.

The incoming class at Union is one of the largest in years, but the senior electrical class is the smallest we have had for some time. There were a large number of casualties after the final June examinations, which were rather difficult. About 60% of those who registered at the beginning of the Junior year are still with the class of '27. However, none of the Eta Kappa Nu men have had any trouble along these lines all of our men getting by the exams with flying colors.

Phi wishes to extend its greetings to the grads of last year and wish them wonderful success in the years to come.

HAROLD T. MASER,
Associate Editor.

Chi Chapter

Lehigh University

This being our first chapter letter, it may be suitable here to introduce ourselves. Chi Chapter was established through the untiring work of our graduate Brothers Althouse, Kear, Nagel, Mong, Foster and Perry, and the aid of Brother N. S. Hibschman of the E. E. Staff at the University. With the exception of our graduate Brothers we have all returned to the University to run the last lap of our career. The remaining members of Chi Chapter are Alfred Staller, J. H. Metz, Challis Britton, T. H. Kemp, N. S. Spatz and J. A. Nicholas.

The first meeting of the year was held shortly after registration. Chi Chapter decided to initiate three Seniors and two Juniors into the ranks of the fraternity. With this aggregate number, Chi is determined to become one of the most active fraternity chapters on the Campus and the backbone of the local branch of the A. I. E. E. and of the E. E. Society.

Chi Chapter takes this opportunity to thank the officers of the National Council in aiding us to have our petition drawn up and granted.

Chi Chapter sends greetings and best wishes for a most successful year to the Brothers of Eta Kappa Nu.

JOSEPH A. NICHOLAS,
Associate Editor.

Alumni Chapters

Los Angeles Alumni Chapter

I received your little reminder approximately a week ago. We are still doing business out here in "God's Country," although, sorry to say, I did not manage to get a letter through on time for the May issue. So much more then in this letter.

To begin then like a newspaper story, and put the last things first. Our next regular meeting will be a business meeting at which time we expect to elect officers, get BRIDGE subscriptions, verify addresses, make plans for the coming year, eat a good dinner and listen to some "good ones." I have received my DRAWBRIDGE and if some of the others have done the same it will materially aid the business of getting subscribers. The

little letter deserves a place right along side the one of last year, "Beware of the Indifference Bug."

September 26th, we enjoyed a rather unusual treat. Among our number we list a YACHTSMAN, Brother Harold Barden is the lucky owner of a yacht. He invited us to sail with him. A crew of sixteen land-lubbers showed, and under the masterful tuition of our Captain we became seasoned old sea dogs. (Seasoned! Sure. With salt.) Of course we looked around for the scales to "weigh the anchor" etc. etc. at first; but eventually we could tell the difference between the "Back-stay" and the "Jib."

The trip out of the harbor was especially interesting because of the large number of Uncle Sam's Battleships that are now stationed in Los Angeles Harbor. As we passed by them at very close range, the opportunity for close inspection was splendid. We anchored in the vicinity of Long Beach for lunch and a few of the hardier ones indulged in a swim. In connection with the lunch I beg to report that all of the crew succeeded in hanging on to their lunches so it was a bad day for the fish. This was one of the best parties that we have had and everyone of us enjoyed it to the limit. Maybe after a while we will have more Yachtsmen.

The call of the sea is very strong in this community during the summer months. So last June 27th, we indulged in a beach party. Through the kindness of Brother and Mrs. Wade, we established headquarters at their home in Hermosa Beach. The desire for swimming seemed only to be eclipsed by the desire for food, when the "Dogs' began to bark. And after the eats came baseball on a sand lot. When we say SAND we mean **SAND.** If you think it was any fun to bat after about the third home run, you're crazy. Anyway each man batted until he dropped in his tracks. We surely got a work out. Cards, etc., constituted the finishing touch to the day's entertainment.

Now if you will skip back to May 20th, you would find us enjoying a splendid Initiation Banquet as guests of our new Upsilon Chapter. The Brothers from this chapter deserve the highest praise for the masterful way in which they managed the Initiation and Banquet. Seven men whom we esteem very highly were brought into associate membership.

This was followed by a Banquet, and then came the Big Surprise. Prof. Biegler was installed into Honorary Membership. The arrangements had been wholly completed without his knowledge and without many of the alumni knowing of it. The sincerity of the desire to honor Prof. Biegler and the sincerity of his appreciation indicated a splendid bond of loyalty between teacher and student, that will mean much towards the success of the Electrical Department at the University of Southern California.

The meeting previous to this was also a joint meeting of the alumni and active chapters. This event was a dance given at the La Monica Ball Room in Santa Monica. Our men must not have realized what beautiful maidens those college men would bring around or more of them would have come out. Or maybe, the wives did realize the condition and took hubby to a movie. Anyway only a very limited number of alumni showed up. We don't know what the missing ones did that evening, but if they had a better time than those at the dance they were going some.

I imagine that to go back any further would make this look like ancient history so I will drop in a few personal items.

Brother C. M. Allen is assisting in the design of large out-door receiving sub-station for the Bureau of Power and Light. He just recently returned from a vacation trip to the East.

Brother Barden has strayed somewhat from electrical work and is selling building and loan stock for the Pacific Coast Building and Loan Co.

Prof. Biegler spent his vacation by working for the Western Electric Co., near Chicago.

Brother G. A. Fleming and Brother Wm. S. Peterson attended the recent A. I. E. E. convention in Salt Lake City, Utah. Brother Fleming has had considerable to do with the design work on the new steam plants of the Southern California Edison Co. Brother Peterson is now doing system planning work and is still with the Municipal Bureau of Power and Light.

Brother H. V. Harris and Brother H. J. McCracken are the mountaineers of our crowd. On Labor Day they went to the top of the U. S. That is they climbed Mt. Whitney, 14,502 feet. They're getting up in life.

Brother F. C. Lindvall is now back at the California Institute of Technology doing post graduate work. He is doing some experimental work on a vacuum switch.

WM. S. PETERSON,
Secretary.

Milwaukee Alumni Chapter

It is with considerable pleasure and pride that we of the Milwaukee Chapter send our greetings to the other alumni chapters of the Association.

Our first meeting was held September 2 at which time Brother Phil. Ryan, of the Cutler Hammer Company, presented a very interesting paper on "Paper Mill Drives." At this meeting approximately 27 members were present, some of them being of the old guard, while several new faces were noted among them.

The chapter plans at least two social meetings and our regular monthly meeting, which is held the first Thursday of every month. At our monthly meetings most of our time is spent at luncheon and a general get-together, while it is our plan to have either one of our members or some individual from outside, present a talk that will be interesting to the greatest number in the chapter.

To date our chapter list is not completed as we have been unable to obtain complete information of the new members coming from the universities to the Milwaukee Industrial Centers. However, we are enclosing a list of the members whom we have on our role and from time to time will send the names and addresses of those members who are not included at the present writing.

Nothing has been done regarding THE BRIDGE subscriptions, but we feel confident that we will have a number of subscribers for you in the near future.

At our last meeting of the year of 1925 and 1926 Brother J. M. Newman was elected President, R. R. Knoerr, Vice-President, while the writer was elected Secretary and Treasurer.

J. L. RAYNOR,
Secretary.

Pittsburgh Alumni Chapter

The annual election dinner of the Pittsburgh Alumni Chapter was held in Dudley's Dining Room, Wilkinsburg, on June 17. The officers elected for the ensuing year were:

President, C. H. Youngstrom, Mu '23; Vice-president, R. R. Sheely, Gamma '21; Secretary, J. H. Harvey, Rho '25; Treasurer, A. H. Barth, Rho '24.

At this meeting the delegate to the National convention was also chosen. M. V. Maxwell, Iota '24, was the successful candidate, and U. L. Smith, Iota '25, was elected as alternate.

Since the election Mr. Youngstrom has been transferred to the San Francisco District Office of W. E. M. Co., in the Industrial Section.

Deo Dewsen, Pi '24, the chairman of the entertainment committee, is working up a program for the coming year which shows promise of being a world-beater. His opening gun was fired on August 26, and was in the form of a dinner dance at the Sylvan Canoe Club on the Allegheny River. Though the vacation season was still open at that time, twenty-three couples were present at the dance, and all say that they were strong for it.

We have been able to get in touch with about forty H. K. N.'s among the new men who have taken up work in this district, and hope to convince them that a solid affiliation with the Pittsburgh Alumni Chapter is much to be desired. We also hope to work out a system whereby a more definite relation between the graduates of coming classes, who will locate in Pittsburgh and our chapter may be set up before the time of their graduation. Naturally any help which the individual chapters will extend toward that end will be greatly appreciated.

JAMES H. HARVEY,
Secretary.

San Francisco Alumni Chapter

Formerly it was our practice when in the active chapter to commence letters such as this with remarks on the general peppiness of all members returning from their long vacation. Since graduating, however, we have had occasion to revise our views and we are glad to report that most of the Brothers have now recovered from the two weeks vacation, which the majority enjoyed during the summer. I say majority, because some of them got three weeks. Under these conditions attendance at our weekly lunches has been good and we brought a successful business year to a close at our first meeting in September when the following officers were elected to serve for the next year:

President, F. A. Polkinghorn, Mu '22; Vice-President, N. L. Best, Mu '24; Secretary-Treasurer, C. S. George, Mu '24.

Since Brothers Polkinghorn and George occupy the same office floor and Brother Best lives across the street, we have every expectation of attaining even closer co-operation with each other than heretofore.

We are particularly anxious to meet any Brothers who may not have otherwise heard about us and for their information we repeat that we are meeting every Friday for lunch at the Clinton, 725 Market Street, San Francisco.

During the summer, we were glad to welcome the following Brothers into membership: Brother W. L. Winter, M '16 and Brothers Grundel, Russell and Walther, all M '26. On the other hand we regret the loss of Brothers Conkling, Lage and Raab, whose business has taken them out of town.

This letter is being written early in October and finds all the Brothers in a state of preparation for Mu Chapter's initiation, which is scheduled shortly. It is hoped to take some associate members in at this time and further announcement regarding this may be expected in the next number of THE BRIDGE.

C. C. GEORGE,
Secretary.

Cincinnati Alumni

I will attempt to introduce myself by saying that I was representative of Tau Chapter at the convention at Urbana in October, 1924. Then, maybe, after you have looked up the signature of this note you will recall who I am. At any rate, I extend my greetings with pleasant remembrances of the convention. And if you have the opportunity, please pass them along to the other officers and members of the N. E. C.

To get down to business; will you please change my address for THE BRIDGE to the above and oblige.

And to leave business again—let me announce that Brother Charles Button, Tau '25 last month betook himself to California and returned with a beautiful wife—beautiful but **not** dumb, for she is a P B K and since Brother Button is both H K N and T B P we may expect all the little "Buttons" to be bright ones. In the way of business, Brother Button is factory representative of Holtzer-Cabot Electric Company in Cincinnati.

I must not fail to tell you of Brother Arthur E. Burroway, Tau '24, who beat Brother Button across the matrimonial channel (a la Ederle) by about one month. Brother and Mrs. Burroway are remembered by the local clan as the host and hostess of a very happy HKN party some time before their marriage and we have great hopes of the future from them.

But in the matter of speed Brother Jackson C. Clagett, Tau '24 is away ahead of the field. Up until a few weeks ago he was looked upon by the wise ones as a well defined bachelor. But at the last HKN Alumni party he proudly introduced us to the fair Mrs. Jackson C. Clagett.

This last HKN Alumni party was held at the spacious grounds surrounding the home of Brother Joe Noertker, Tau '23. This was attended by about 25 couples and enjoyed tremendously by all. Brother and Mrs. Noertker are past masters in the art of entertaining.

Late in the summer HKN held a stag banquet at the Green Lantern Tavern which was attended by about 30 brothers. We were honored on this occasion by Brother A. M. Wilson, Hon., who favored us with some of his Scotch witticisms.

There is a strong suspicion that the HKN Alumni in these parts are fast becoming a matter of consequence of which you will hear more later. Incidentally, we are expecting Tau Chapter to be the convention host in 1927.

Your humble servant had the pleasure last week of lunching with Brother George A. Arnold, Ohio State, and Brother Middleton, Purdue, Sales Promotion Manager and star salesman, respectively, of The Master Electric Co., Dayton, O., manufacturers of small motors. Incidentally the third brother at the table was Chief Engineer of the B. A. Wesche Electric Co., manufacturers of general purpose motors.

Brother E. G. Norell, Tau '26, is doing his stuff in Boston with the Stone & Webster Co., Brother S. T. Fife, Tau '26, is Mathematics Instructor at the University of Cincinnati (serving his Alma Mater as it were) and reports an ambitious crew in his care.

It is time to lay off the gossip in which I had no intention of indulging anyway. So here goes.

Fraternally yours,
RAY T. CONGLETON, Ta '25.

The Future in the Public Utility Field for College Men

Continued from page 16

It is generally recognized that positions in public utility companies do not pay princely salaries, but they do pay well. If a man's idea of success is making money and making it quickly, then he had better give up all idea of entering employment in this field. He will do much better to play the stock market on a margin, take the chance of robbing a bank, or go into some equally hazardous business adventure. If a man is looking for position and power, it is possible for him to achieve it through service with a public utility. There are plenty of important jobs—and there are not always jobs with the title of president, general managers, or chief engineer—that will give a man all he desires along this line if he has the ambition and the ability to rise.

The policies and points of view of public service corporations have changed. That well-worn phrase, "The Public be Damned" has been dead and buried for many years. Instead of this, we have the opposite slogan which I have already mentioned, namely, "Better and More Efficient Service." As a result of this, the old captain of industry, as pointed out by Walter S. Gifford, President of the American Telephone and Telegraph Company, has almost dropped from sight. His place is being taken rather by what he termed "statesmen of industry." The task of such men is less to carry out a place for their business or for themselves than it is to carry forward a highly organized undertaking already established. They must not only serve what has been built but add to it. They must be peculiarly qualified, since these tasks call for civic sense, a broad, human understanding, administrative ability, sound judgment based on analysis of facts, as well as the usual qualities of initiative, leadership, and the ability to make decisions.

Every college man, I suppose, has, down in his heart, a desire to eventually become one of these "statesmen of industry," or at least to be fairly close to one from the standpoint of position on the organization chart. Whether he can actually attain this pinnacle of success is dependent entirely upon him. He must began early in analyzing his abilities and his interests. The sooner he does this, the quicker he becomes sure of himself and the easier it will be for him to look ahead toward future progress.

Public utilities, generally speaking, offer a wide field to college men who have all or some of the qualities which have been listed, at least to a certain degree. The measure of the degree to which a given man has these qualities

(Continued on page 42)

Lost Souls

Please send us addresses for as many of these men as you can. You will confer a favor on both the lost brother and ourselves. Perhaps if we could reach him he might like to read THE BRIDGE

ALPHA
A. W. Ames, '11
C. A. Borgeson, '25
F. B. Doyle, '20
H. C. Fellman, '07
F. A. Forty, '15
S. H. Grauten, '07
J. W. Hart, '24
J. C. Koonz, '25
W. S. Nelson, '14
E. S. Scott, '14
H. J. Weaver, '06

BETA
M. R. Jones, '15
I. B. Middleton, '16
W. A. Rush, '06
F. W. Russell, '24
M. R. Smith, '22
R. A. Smith, '14
W. K. Stacey, '06
G. V. Woodling, '23

GAMMA
C. P. Dibel, '16
A. A. Dicio, '11
W. S. Kaufman, '13
O. McGinnis, '23
R. C. Moore, '20
W. H. Noble, '14
R. J. Pepper, '17
A. C. Philpot, '12
W. Sandoz, '18
J. N. Stanbery, '25
R. S. Vanatta, '11
J. E. Wilson, '15
J. A. Zink, '08

DELTA
S. Bloomberg, '20
W. L. Borroughs, '15
E. R. Ewin, '22
G. C. Kumbera, '21
A. S. Lau, '20
W. W. Pierce, '21
O. L. Richards, '10
H. Rose, '09
J. Smely, '20
H. D. Stevers, '20
F. A. Swanson, '14

EPSILON
W. I. Alexander, '11
D. C. Ellinger, '19
C. W. H. May, '12
A. T. McNiele, '14
T. F. Riemer, '16
E. M. Webber, '11
W. I. Woodcock, '13

ZETA
T. A. Burdick, '14
H. D. Cameron, '17
G. Geyser, '24
C. A. Groetzinger, '15
R. G. Hornberger, '22
H. W. Howard, '23
W. E. McFarland, '19
G. Sherrard, Jr., '15
H. M. Smith, '14
E. J. Sweeney, '18
C. G. Warner, '13

THETA
G. M. Chritzman, '14
F. I. Fairman, '25
R. H. Johnson, '13
W. Murrish, '11
C. W. Pottinger, '18

IOTA
R. S. Bailey, '12
C. R. Miller, '23
R. H. Standley, '19

KAPPA
C. C. Brown, '24
R. E. Bussey, '18
C. B. Clark, '22
F. H. McBerty, '19
G. Rees, '19

LAMBDA
M. F. Goodheart, '13
D. G. Grosner, '15
E. A. Millar, '15
H. M. Wood, '14

MU
T. S. Cole, '16
W. R. Kemper, '17
H. L. Smith, '21
R. M. Steed, '16
C. A. Woodrow, '24

NU
H. K. Johnson, '23

XI
C. H. Bradley, '21
M. M. Collins, '24
W. W. Foster, '23

PI
S. E. Caldwell, P '23

RHO
P. C. Edwunds, '23
C. W. Keller, '23

SIGMA
J. H. Joynt, '25

TAU
J. L. Clagett, '24
W. F. Dunkle, '23
L. B. Rafsnider, '24
G. A. Smith, '24

ASSOCIATE
W. A. Gatward
J. F. Putnam

The Future in the Public Utility Field for College Men

Continued from page 41

is, without doubt, a measure of the success which he achieves. There is plenty of work to be done in the public utility field and there are, unfortunately, too few men capable of doing this work in the best way. The field is open, and it is not without a certain amount of adventure. Plenty of opportunities exist; advancement comes in a direct measure of a man's ability to do his job and do it well. Financial remuneration is adequate and, everything considered, is equivalent to what can probably be attained in other fields of work. Taking it all in all, the public utility business is an excellent field in which to work and the future in it for men of ability is splendid.

The sooner that a young college man begins to analyze himself and to think about his future in the business world, the better off he will be. And if I have, in these few paragraphs, given him any incentive towards solving his own personal problems in this direction and spurred him on to give some thought, at least, to the opportunities which exist for him upon graduation, then I will have achieved a measure of success.

Eta Kappa Nus

Professor **C. A. Wright, Assoc.,** has been granted a leave of absence for one year, beginning last June from the Department of Electrical Engineering by the Board of Trustees of Ohio State University. Professor Wright has accepted a very flattering proposition to do special research work in connection with radio apparatus for the National Carbon Co. of Cleveland.

Professor Wright goes with the expectation of returning to the work of the department, but the compensation which he will receive is so much more than the salaries that are now being paid in colleges that it is all too possible that he may be persuaded to remain permanently in this new work he has undertaken.

* * *

The Technograph of Illinois University recently announced that Brother **Abner R. Knight, G '09,** is co-author with M. A. Faucett of Experiment Station Bulletin No. 153 entitled: "The Effect of Temperature on the Registration of Single Phase Induction Watthour Meters."

This bulletin contains the report of an investigation which was undertaken to determine the effect of temperature upon the registration of two-wire, single-phase watthour meters. Since such meters are often located in places subject to wide changes of temperature, it was considered important to ascertain how the registration is effected thereby.

* * *

Brother **Ralph B. Stewart, Assoc.,** announces the opening of an office for the practice of patent trademark law at 406 International Bldg., Washington, D. C. Brother Stewart has been a member of the examining corps of the U. S. Patent Office for several years.

* * *

Brother **H. C. Silent, M '20,** wrote us from England last July, saying: "Here we are again in Merrie England. Have been here now for about three months in connection with the Trans-Atlantic radio telephone experiments of the A. T. & T. Co., and the British Post Office. Mostly the former. No certainty when I will return to the land of Liberty and Bad Likker. When I look at the prices of it here (good likker, I mean) it makes me feel quite at home, however. And by the way, if any of the boys are getting discouraged trying to get a phone call thru from the Bronx to their girls in Brooklyn, tell them to come over here and try it. And then when they have grown whiskers in England, let them go to France. If you want to call someone there you make an appointment with them by mail at least a month in advance. A Frenchman who was piloting me about Paris called a garage one day to rent a car. After trying to get them for thirty minutes by the clock he got disgusted, said a few Mon Dieus and Sacre Blooies, hailed a taxi, went to the garage and returned in twenty minutes with the car. I mean he actually did that, and it all happened that way, and I'm not exaggerating either. Yours until a Paris telephone operator says 'Number, Please?'"

* * *

Brother **H. H. Race, K '21,** is co-author with M. G. Malti of a paper which appeared in the March, 1926, issue of the Sibley Journal entitled "The Algebra of Complex Numbers."

* * *

Brother **J. C. Peters, Jr., E '24,** has left the Leeds and Northrup company of Philadelphia, where he was employed in the Research Department since graduation. He is now enrolled in the Graduate School of Columbia University, where he expects to devote his entire time during the present school year to the study of physics.

* * *

A new alpha-ray track apparatus, which makes visible in water vapor the path taken by an alpha-ray has been completed after many months' work by Professor **Charles T. Knipp, Honorary,** of the University of Illinois. Professor Knipp is the first person to construct a simple, cheap machine which shows the tracks in a perfect form.

* * *

Professor **Hugh A. Brown, Assoc.,** of the University of Illinois, was married recently to Miss Carrie I. Needham of Urbana. Professor Brown is well known for the alkali vapor radio tube which he developed with Professor Knipp. He also developed with **C. A. Keener, Associate,** a non-carrier wave system of radio telephone transmission.

* * *

Brother **F. K. Leisch, T '25,** has recently accepted a position with the A. C. Nielsen company of Chicago after having, for the past ten months, been with the General Electric Co. on test. Brother Leisch is living at 830 Lake Avenue, Wilmette, Ill.

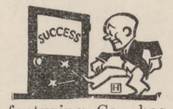
* * *

After a summer spent in the relay section of the Detroit Edison Company, Brother **A. Naeter, Associate,** is back in East Lansing as Associate Professor of Electrical Engineering at the Michigan State College.

* * *

Eta Kappa Nu brothers presented four papers at the Annual Convention of the A. I. E. E. in White Sulphur Springs, June 21 to 25th. Brother **R. E. Doherty, A '09,** and Brother **C. A. Nickle, E '18,** presented "Synchronous Machines"; Professor **Bedell, Hon.,** of Cornell, "Non-Harmonic Alternating Currents"; **D. C. Prince, A '12,** "Mercury-Arc Rectifiers", and **G. E. Luke, I '16,** "Surface Heat Transfer in Electric Machines With Forced Air Flow."

* * *



Brother **Roscoe Seybold, B '07,** formerly manager of price statistics of the Westinghouse Electric & Manufacturing Co., has been appointed assistant to F. A. Merrick, vice-president and general manager of the company. Brother Seybold has been with the W. E. & M. Co. since 1907. After the completion of his apprentice course he was placed in the price department and later was transferred to the sales department, where he was located for some years prior to this present appointment. Good luck in the new job, old man.

* * *

Brother **C. E. Mowry, Mu '23,** whose silver tongue and engineering logic have sold many an Exide storage battery, is now lending his efforts to increase the sale of Byron Jackson Pumps, a local product of which we are justly proud in San Francisco.

* * *

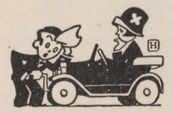
The following extract from a circular letter issued by The Caroline Power and Light Co., Raleigh, N. C., may interest some of the brothers. "This is to advise . . . that Mr. **R. P. Crippen, (Mu '21),** has been appointed Relay Engineer. . . . ."

"Under Mr. Crippen's jurisdiction" is included "all relays, automatic equipment, Tirrell regulators, line drop compensators, the adjustment of induction feeder regulators, contact making voltmeters, switchboard meters and instruments by which customers are not billed and all tests of a technical nature. Mr. Crippen will also have charge of educational work of the Power Department."

* * *

Scott R. Ruby, Mu '23, is a "food" engineer with M. C. Threlkeld, commissary contractor, and is just now supervising the chili beans and macaroni on a railroad construction project near Phoenix, Arizona.

* * *



On the eve of his leaving the Berkeley Police Department after five years' service, Brother **Edward Maeshner, Mu '23,** surprised his numerous friends by marrying Miss Ruth Herrick of Berkeley. The ceremony was held June 12, at San Francisco, and the young people left immediately for a three weeks' motor trip to Canada. Brother Maeshner has accepted a position with the Pacific Telephone and Telegraph Co., with headquarters in Sacramento, and the newly-weds are now making their home in that city.

Brother **Norman Powne, Pi '22,** has finally deserted the ranks of the "batchelorus confirmae" and moved to that siren state of matrimony—poor brother. However, we are glad to state that he has survived the first two months so there is yet hope that he will live to the ripe old age of 30. Miss Olive Edney of Oakland, California, was the blushing bride — congratulations, to both of you.

* * *

Brother **G. B. Abraham, Pi '24,** passed the "seegars" March 29, 1926. Yes, it was a boy—named Robert Elwood. Everyone concerned survived—the father included. Young Abe is expected to be a great help to his father.

* * *

Brother **Eugene Wm. Staph, I '11,** a charter member of Iota, is now Refrigerating Engineer for the San Antonio (Texas) Machine and Supply Company.

* * *

Brother **V. W. Surber, I '11,** another charter member of Iota chapter, is now a general contractor, Federal Oil and Gas Building, Akron, Ohio. Brother Surber was a bidder on the Missouri Memorial Stadium.

* * *

Brother **Benjamin E. Fuqua, I '24,** is Budget Engineer for the Henry L. Daugherty & Company, Public Utility Operators, 60 Wall Street, New York City.

* * *

Brother **Logan G. Grigsby, I '18,** is with the Illinois Power & Light Corporation, 15th floor, Illinois Merchant's Bank Building, Chicago.

* * *

Brother **E. Lage, Nu '25,** recently resigned from the Valuation Department of the California Railroad Commission and also from his single state. He was married early in September to Miss A. Lilley, and is now working for the Key System.

* * *

Brother **Carl Greim, T '24,** was in Columbia last week attending the Tau Beta Pi convention. He is stationed at Joplin, Missouri, and we hope he will make an attempt to attend our convention in November.

* * *

Steady readers of THE BRIDGE may remember some years ago hearing that Brother **C. R. Currier, Mu '24,** functioned as best man at Brother C. S. George's wedding. On September 25, Brother George returned the compliment when he safely shepherded Brother Currier through the ordeal. Miss Claudia E. Gratton was the blushing bride, and the young couple have now taken up their residence at 1241 30th Avenue, Oakland.

* * *

Another student in the Test Course at the General Electric Co., Schenectady, is Brother **Lewis E. Peterson, O '25.** He lives at 1036 Eastern Avenue.

News of the marriage of Brother **James Keith, Jr., Mu '21,** to Miss Esther Lewis at Riverside has just reached us. Brother Keith is employed as a designing engineer for the Southern Sierra Power Company.

* * *

Brother **Robert S. Wright, I '26,** is in the Research Laboratory of the Westinghouse Company, East Pittsburgh, Pennsylvania, working under George Luke I '16. "Bob" is rooming with Tom Cunningham, I '26, who is in the General Electric Company's Radio Laboratory.

* * *

Another Brother fell by the wayside on September 3, when the marriage of Miss Janice Hoyt and Brother **Bill Newton, Mu '22,** took place. They are about to depart on their honeymoon, but considerable secrecy attends their departure; and at the time of going to press our most urgent inquiries at the headquarters of the Pacific Gas and Electric Co. in San Francisco, where Brother Newton works, have failed to elicite information as to their proposed destination.

* * *

Brother **H. R. Berry, Mu '23,** is a Transmission Engineer with the Pacific Telephone and Telegraph Co., and once upon a time took a great interest in radio. However, on May 20, William David arrived and now competes so successfully with the loud speaker as to render Brother Berry's interest therein entirely nugatory. Prospective Brother William weighed 13 pounds, as we go to press.

* * *

Brother **L. L. Strong, Pi '24,** now located in Seattle, gained considerable notoriety and publicity recently when his picture appeared in The Pacific Telephone and Telegraph Co.'s magazine under the caption, "Engineer Strong is striving to appear happy though married." Yes! the fateful event occurred in that dreaded month of June when so many good men lose their liberty. Miss Clara Allen was the better half, the ceremony taking place at her home in Portland, Oregon. Congratulations to the both of you.

* * *

Another one of our brothers from California has lived true to form. After spending three years with the Westinghouse Company at Pittsburgh, **C. H. Youngstrom, Mu '23,** decided to spend his vacation this year back in Sunny California. The contrast between the two parts of the country was too much for "Swede" and we now find him working in the Industrial Sales Dept. of the Westinghouse Company in San Francisco. No more smoky Pittsburgh for him. For the benefit of all eligible females our handsome "Swede" is still enjoying the liberties of singleness.

* * *

The quietude of the Quaker City evidently palled on our Brother, **A. Wolf, L '24,** who has recently left the Philadelphia Electric Company and has entered the service of the Sun Oil Company, located at Dallas, Texas.

Brother **W. D. Buckingham, Z '25,** is with the Western Union Telegraph Co. in Cleveland. He lives at 839 Oakwood Avenue.

* * *

Occasionally we meet a Brother who definitely knows in his junior year what he is going to do when he graduates, less frequently we find a brother who actually follows out his plans. Brother **Hilton Lusk, Mu '25,** is one of these. He took his MS degree with a view to teaching and now has an assistant professorship in electrical engineering at the College of the Pacific. **Bert Meyer, Mu '25,** has also gained his MS and is now an assistant in the heat power laboratory at the University of California.

* * *

Brother **H. J. Raab, Mu '24,** after spending a year and a half in the valuation department of the California Railroad Commission, is now doing valuation work with the Key System Transit Co. of Oakalnd. The object of his work with the Commission was to show that the rates of the public utilities were too high, while now he is trying to prove to the Commission that the Key System should have an increase in rates. These fickle engineers, it was ever thus.

* * *

Another illuminating brother is **D. O. Rusk, M '24,** Curtis Lighting of California, Inc., 3113 West Sixth Street, Los Angeles, California.

* * *

Brother **Kenneth L. Scott, T '21,** can be reached at 1053 North Lawler Avenue, Chicago. He is with the Western Electric Company, Hawthorne Sta., Chicago.

* * *

Brother **Wilbur A. Moore, P '26,** is now with the New York Edison Company, Vandam Street, New York City. His residence address is 3 Claremont Place, Cranford, New Jersey.

* * *

Another Chicagoan is Brother **William Allen Mann, A '23.** He is Sales Engineer for the General Electric Co., 230 So. Clark Street, Chicago.

* * *

Still another Brother with the Pacific Telephone & Telegraph Company, 140 New Montgomery Street, San Francisco, California, is Brother **Austin Walther, M '26.** When not busily engaged as Traffic Student he may be reached at 2617 Durant Avenue, Berkeley, California.

* * *

Another Sales Engineer, — Brother **Nelson Louis Best, M '24.** He is with Johns-Mansville, Inc., 159 New Montgomery Street, San Francisco, California. He ought to be able to keep a roof over his head.

* * *

Brother **A. Wm. Roth, I '25,** is stationed at 1451 Elm, Wilkinsburg, Pennsylvania.

With a sudden rise to prosperity, Brother **Frank W. McDonnell, K '19,** left the New York Edison Company to become president of the firm of Rossiter, Tyler & McDonnell, Inc., at 136 Liberty Street, New York. They are engaged in consultation, commercial tests, and research in radio engineering. Tomorrow we shall go down to interview Frank and attempt to inveigle him into putting out a little of the secret formula so that the rest of the brothers, too, may become president of their respective companies in the space of six years.

* * *

In the Indianapolis office of the Westinghouse Company one might find upon close inspection of the Industrial Division none other than our worthy Brother **R. P. Barnes, Mu '24.** It seems that Indianapolis is not all that it should be, even if they do boast a brick racetrack, and Barny is reputed to have said that he would walk back to California if he thought anyone would hire him when he got there. Columbus took a chance and even if Barny didn't get a job, we know the hike would be most invigorating.

* * *

We were wondering of late why the G. E. Motors were not up to standard and after a little investigation learned to our surprise that **J. B. Pitman, Mu '24,** is night head of the G. E. Motor Test Department at Schenectady. It seems that some of the test hook-ups are rather complicated and since the new management assumed control it has been found to save a lot of time and trouble to pass the machines as O. K. without going through the meaningless process of reading wattmeters, voltmeters, tackometer and etc. Anyhow, if the machines don't stand up in service it can always be blamed on hysteresis.

* * *

Can two live cheaper than one? The answer to this most unique question is desired by Brother **J. A. Holden, Mu '24.** It seems that the munificent stipend which Uncle George Westinghouse compensates our esteemed brother for his services in the Industrial Division of the Cincinnati Office is not what it should be and John is open for suggestions. At any rate, the tinkle of wedding bells is faintly heard in the distance, or maybe we are fooled—Christmas is coming.

* * *

Before an embankment of palms in a cozy little home in Edgewood, Pennsylvania, our Brother, **Clinton R. Hanna, B '22,** took unto himself a bride in the person of Miss Dorothy R. Wilharm of Wilkinsburg, Pennsylvania. If my recollection is correct, the palm is a symbol of victory and judging from the fact that the ceremony took place in the bride's home, and considering the import of the bride's maiden name, there seems but little doubt as to who is the vanquished party.

If any of our Brothers need new electric steam shovels, **R. W. Barr, Mu '24,** can fix them up very nicely. Bunk is now assistant to the Chief Engineer of the Bucyrus Shovel Co., Milwaukee, Wis., and since Prohibition when the steam was removed from beer there was nothing left to do but use electricity. From all reports married life seems to be all bliss.

* * *

L. B. Dodds, Mu '25, after finishing the G. E. Advanced Engineering Course, has decided to try a little patent work with the G. E. Co. at Washington, D. C. If any of the brothers invent a perpetual motion machine or a new method of selling post holes by the box, we refer you to Laurie.

* * *

There is a slogan in California known as "Pacific Service" and **W. C. Cauthen, Mu '24,** is doing his best to show the San Francisco East Bay District what the word "Service" really means. Bill, after two years in the Advanced Course at Schenectady, is now one of the main springs in the Maintenance Department of The Pacific Gas and Electric Co. in Oakland, with headquarters at Station "H." If the fuse blows out in the house or the door bell doesn't ring, just telephone Lakeside 5000 and Bill will have it fixed in a jiffy. We understand that he is still single and no prospects in sight. Poor girls, they don't know what they are missing.

* * *

Brother **James R. Nelson, U '25,** is on test with a scad of other brothers at Schenectady.

* * *

Pittsfield, Mass., again has taken the fancy of one of the Brothers, **Eugene C. Starr, P '23,** who is on test at present.

* * *

William R. McCann, T '15, is with the Atmospheric Nitrogen Corporation at Syracuse, New York, engaged in the low practice of picking the air to pieces, bottling its component parts and selling the bottled goods to the dear public.

* * *

Some of us are content with a crystal set, some of us demand the latest supahet, and others actually go into the radio game. **E. R. Meissner, Mu '24,** after finishing the G. E. Advanced Engineering Course, has decided to chase electrons around the vacuum tube and has gone into radio research work at Schenectady. Any of the brothers who need some special advice can address their communications to 20 N. Church St.

* * *

Another of our brothers who supplemented his college training with a test course at G. E. was **W. H. Martin, Mu '24.** It seems, however, that employment with these large manufacturers is not very lucrative because our worthy brother has forsaken the fold for a job with the Century Electric Co. in St. Louis. Besides learning what makes motors run, we understand that Bill is acquiring some knowledge about that mysterious animal "The Missouri Mule."

Brother **R. L. McCoy, Z '23,** announces that he was married on Sept. 9th, 1926, to Miss Kathryn Kleinhaus of Wellington, O. Brother McCoy peddles insulators for the Locke Insulator Co., making his headquarters at Room 1101 Union Trust Bldg., Cleveland.

* * *

Brother **Roy N. Phelan, Mu '22,** has relinquished his duties as associate editor to become assistant business manager of the Journal of Electricity, a McGraw-Hill publication serving the electrical industry in the eleven western states. Also he has been elected secretary and treasurer of the McGraw-Hill Company of California. Roy's office is located at 883 Mission Street, San Francisco—his door is always open to HKN Brothers.

* * *

Brother **Ray S. Quick, M '16,** wishes to announce a new arrival on August 10, of Miss Betty Jean—weight about 7 pounds 4 ounces. In preparation for the event, Brother Quick moved his family from San Francisco to Burlingame, where he now resides at 115 Costa Rica Street, and where, we understand, the sun shines all day and most of the night.

* * *

Now that Uncle Sam has become pretty particular about such things as Underwriters Laboratories, Eta Kappa Nu men naturally have been in demand. After looking over a couple of thousand prospects, Brother **Harold Glove, D '23,** was selected to do the honors in the capacity of an electrical expert in the Chicago section. After a hard day's work Glove is nearly worn out but by quickly sneaking down to the Greasy Palm he resumes his original offhand manner and becomes such a hand-some man-ual hardly recognize him with his high hat and walking stick accoutrements.

* * *

Brother **J. R. Wohrley, G '14,** claims the title of Efficiency Engineer with the H. L. Doherty Co., 60 Wall Street, New York City. We sincerely trust that his methods of practicing the work does not include the proverbial application in which the man left his neck dirty so that his last shirt would look clean.

* * *

Brother **J. H. Hunt, Hon.,** is working in the Research Laboratory of the General Motors Company trying to find out how Chevrolets can be made as good as Cadillacs. His residence address is 144 Edison Avenue, Detroit, Michigan.

* * *

About a year ago we announced the marriage of **"Honest Ira" Cole,** therefore a confirmed bachelor of the innermost order. We were greatly pleased thus to write "Chapter I" of the second or "domesticated" part of his life and now take additional pleasure in publishing "Chapter II"—the arrival of Catherine Irene, August 3, 1926.

This notice comes a little bit late for the boom but no doubt there are a lot of stragglers who can take advantage of this golden opportunity. For Brother **Nels H. Erlandson** felt the pulse of the public a couple of years ago and hopped into the first get-rich-quick scheme that came along. The funny part is that he did get rich. He picked on the well known article of necessity for those who drive their own cars (or some one else's)—the tourist garage. After becoming the owner of such a prosperous enterprise, Erlandson cast about for a suitable location that day and night the never satisfied public might demand his superior creation, and he naturally found himself in Daytona Beach, Florida. To complete the picture he located the house of business at 209 Grandview Avenue, which is only about two skips and a jump from the old beach itself. The editor of THE BRIDGE would be glad to investigate the possibility of securing rates by ordering in quantity lots since he expects to be in a position to appreciate such things by the time he arrives in that part of the U. S.

* * *

Brother **Chase Donaldson, T '20,** is now the proud father of a son—Paul Robert, who arrived in town October 9, 1925. If our information is correct, this is the "twoth." Brother Donaldson at least has exercised good judgment in that one of the two is a girl and the other is a boy. All of which that has just been said calls to mind a remark that Chase once made upon receiving congratulations on the first arrival, and also some kidding as to his expedition in the matter of raising a family. The kidding was handed out by one who had no family, although he had been married for several years and Chase's retort was "One is proof." We will concede this and perhaps we will accept two as added verification, but we are compelled to announce at this time that we will rate three positively as poor engineering.

* * *

Brother **J. D. Vallier, A '22,** has been transferred from Schenectady to the Chicago office of the G. E. Co. He is a commercial engineer. Brother Vallier lives at 1445 East Marquette Road.

* * *

Another "Lost Soul" hath arisen from the deep silence of the virgin mountains — Brother **Ford C. Ritner, P '25,** with the West Penn Power Company of Greensburg, Pennsylvania.

Far from the maddening crowd's ignoble strife,
His sober fancies have but little chance to stray;
Among the cool sequestered vale and hills,
He lives contentedly in Greensburg, P A.

Apologies to Gray.

Brother **Horace H. Ratcliff, B '24,** took unto himself a wife on Sept. 16. He and Miss Lila M. Ekern became one in Madison, Wis. During the day Brother Ratcliff sells stuff for the Cutler-Hammer Mfg. Co. and then goes home to 508-52 Street, Milwaukee.

* * *

Brother **Howard D. Fogle, P '25,** believes in going a long way from school to take a job. He studied in Corvallis, Oregon, and now he is working in Sharon, Pa., in the Power Transformer Design Department of the Westinghouse Co.

* * *

Brother **Sheldon K. Towson, Z '23,** has left the Cleveland Iceless Cooler Co. and is now cost engineer with the Elwell Parker Electric Co. in that city. He was married on June 30th to Miss Gertrude Moeller of New York City and is making his home at 2854 Winthrop Road, Shaker Heights, Cleveland.

* * *

The New York Telephone Company, looking for men to promote, just naturally picked out Brother **C. S. Rhoads, B '16,** who now breezes about under the title of Division Equipment Superintendent over at 309 Washington St., Newark, N. J.

* * *

In the recent reorganization of the General Engineering Department of the Westinghouse Electric and Manufacturing Company, Brother **G. E. Stoltz, G '09,** formerly head of the Steel Mill Section, and well known for his trade activities in that industry, was promoted to Manager of Industrial Engineering. Brother Stoltz was born in Gettysburg, Ohio. He received his preparatory school training there, and was graduated from the Ohio State University in 1909. Immediately following his graduation he entered the apprentice course of the Westinghouse Company. After finishing this course he entered the Steel Mill Section of the General Engineering Department, first as an engineer and later as section head. He retained this latter title until his recent promotion. During his activity in the steel mill industry he placed into operation the first alternating current adjustable speed set in this continent. He also assisted in placing into operation the early reversing blooming mill equipments, and cooperated in the design of the recent single unit reversing equipments. Brother Stoltz is a member of the American Iron and Steel Institute, the Association of Iron and Steel Engineers, the A. I. E. E. and the Engineering Society of Western Pennsylvania, and has delivered a number of talks and papers before these various organizations.

* * *

Brother **Harry A. Boyce, B '25,** is in the Transmission Engineering Department of the American Telephone & Telegraph Company, 311 West Washington Street, Chicago, Illinois. Brother Boyce was married on October 31, 1925. He gives his address as Delta Tau Delta House, Evanston, Illinois.

The Assistant Chief Accountant of the Public Service Co. of Colorado is Brother **W. D. Virtue, I '19.** Brother Virtue lives at 1372 Marion Street, Denver.

* * *

Occasionally we hear from a brother who hasn't peeped in years. When such a brother sends a subscription we are always reminded of the old parable of the "Ninety and Nine." Verily we get more pleasure from a subscription received from a brother who has suddenly come to life than from fifty subscriptions received from regular subscribers. **Mark A. Weckerly, B '16,** gave us one of these thrills recently. He is Assistant Engineer of experimental and development work for the Toledo Scale Co., married, two sons—Kenneth Ray, 3½ years old, and Stuart Paul, 6 months—and lives at 1356 Prospect Avenue, Toledo.

* * *

Rockord, Illinois, has a Bell Telephone Co. Brother **V. S. Allen, B '24,** helps them out as a student engineer for a few hours a day when he is not home at 207 N. Winnebago Street.

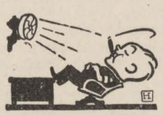
* * *

The Doherty Training School in Denver has enrolled Brother **Harold F. Hoebel, T '25.** He lives at 624 E. 12th Avenue, Denver, Colo.

* * *

We extend our apologies to Brother **L. A. Mollman, A '25,** who is at present in the Power Supervision Department of the Union Electric Light and Power Company of St. Louis, Missouri, for erroneously classifying him in the matter of residence as an inmate of Missouri. Since the conclusion of the late lamented World Series it is sort of an insinuation on one's sanity to arouse an inference that he lives in St. Louis. Missouri in general and St. Louis in particular now have undisputed claims to the world's championship in noise making and general delirium. Brother Mollman lives in East St. Louis, Illinois.

* * *



Brother **C. R. Tunell, O '25,** is employed as financial engineer with the General Electric Company at Schenectady, N. Y. His residence address is 841 Union St., Schenectady, N. Y.

* * *

The official leather medal for bravery and foolhardiness for the current year is herewith awarded to Brother **Neil Gorman, K '16,** who is in the contracting business in Tientsin, China, as Junior Partner of the firm McDonell & Gorman. Brother Gorman was married on November 7, 1925, in Tientsin to Miss Ruth Stevens. The present address of the family unit is 29 Consular Road.

* * *

One Jeanne Virginia is an additional personage since April 26th last, in the family of Brother and Mrs. **William B. Dehr, A '22.**

Brother **M. S. Luthringer, A '25,** has been transferred once more by his company and he is now in the Engineering Department of the Central Illinois Public Service Company, Springfield, Illinois. It takes a well trained grass-hopper to follow the jumps this boy takes.

* * *

Brother **James Oscar Bennett, E '25,** is with the Western Electric Company at Chicago, Illinois, in the position of Cost Reduction Engineer. On his overtime Brother Bennett is assembling a clientele of H. K. N. brothers,—preferably those with large families and small incomes, — his service being to readjust their personal and domestic financial affairs so that their expenses are not more than 200% above their incomes.

* * *

A full assortment of rubber set cat's whiskers is offered to the member who first correctly memorizes the following data concerning one of our remotely located brothers:

Name—**Aproniano A. Brion, B '24**
Residence Address — 63 Bonifacio St., San Pablo, Laguna, Philippines.
Company—Escudero Electric Service
Business Address — Box No. 3, San Pablo, Laguna, Philippines.

* * *

Dean B. Masters, T '24, is located with the Commonwealth Power Corporation of Jackson, Michigan, and maintains a residence address at 908 Lansing Avenue in that city. The only thing that I can think of against this arrangement is that I once bought a bond of that company at 87 and sold it a few weeks later at 84, whereupon it promptly rose to 104 and has been at about that figure ever since.

* * *

Brother **Frank M. Holaday, B '23,** is living at 870 Main Street, Oshkosh, Wis.

* * *

Brother **J. R. Furber, O '24,** is with the Northern States Power Company, 15 South Fifth Street, Minneapolis, Minn., as Sales Engineer.

* * *

It takes a heap big medicine man to cast a charm over the untamed swirling rapids of the Father of Waters and, driving out the evil spirit from the troubled waters, chase it through the filament of an electric light bulb and thus change night into day. This is what Brother **Leroy A. Grettum, O '23,** is doing when he puts on his war paint every morning with the Wisconsin Railway Light and Power Company in its offices at Winona, Wisconsin.

* * *

Brother **Chester C. Hough, K '17,** who distinguishes our order by being an officer in the United States Army, was married on March 6th, last, to Miss Neely Rose at Leavensworth, Kansas. Lt. Hough was assigned to the Air Corps as of Sept. 13, 1926, and is now a student at Brooksfield, Texas.

Brother **William H. Horne, Jr., K '23,** is assistant to the General Superintendent of the Poughkeepsie District Operating Development of the Central Hudson Gas and Electric Company. He lives at 12 Conklin Street, Poughkeepsie, N. Y. Brother Horne's chief function is attending the inter-collegiate regatta at Poughkeepsie each spring. We have a suggestion out of which Brother Horne might be able to make a little graft money during the crew races. We suggest that he devise a series of underwater boat magnets to set in the respective lanes so that he can retard the progress of the non-paying gentry and give a free run of the river to those crews from which the largest stipend was forthcoming.

* * *

Brother **Lester T. Avery, Z '18,** has left the electrical game but sends in his subscription anyway. He is District Manager in Cleveland for the American Carbonic Machinery Co. After eight years of married life he says his family boasts of two daughters, a cat and dog, and lots of debts. It is our claim, Brother Avery, that THE BRIDGE should be interesting to a man who is not in electrical engineering, at least we try to make it so. Besides helping THE BRIDGE, every subscription helps to carry the overhead for the benefit of the youngsters who are coming along each year. Thanks for the boost.

* * *

Brother **Walter Sturrock, K '16,** was married to Miss Lela B. Radabaugh, at West City, Ohio, on July 8. They are living at 1876 Knowles Street, Cleveland, Ohio.

* * *

Brother **D. J. Prudhomme, P '26,** is employed with the General Electric Company. He lives across the river from Schenectady at 18 Riverside Avenue, Scotia, New York, the town where the houses still show the tomahawk marks of the French and Indian Wars.

* * *

Brother **Charles A. Dougherty, E '20,** left the Detroit Edison Co. of Feb. 22, 1926, and now is with the Penn Central Light and Power Co. at Altoona, Pa., as electrical engineer in charge of operation, construction and standardization.

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At the new Coney Island yard of the B. M. T. Co. you will find Brother **J. Foss Parnin, B '23.** Brother Parnin lives at 325 W. 89th Street, New York City.

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Another Brother who laments the fact that school days are over is **A. R. Hopkins, G '26,** who is in the Radio Engineering Department of the Dayton Fan & Motor Company, Dayton, Ohio.

* * *

Brother **H. E. Lockett, G '19,** has graduated from the "Lost Soul" column and is found to be with the General Electric Company at 6801 Elmwood Avenue, West Philadelphia, Pennsylvania. His home address is 528 Laurel Road, Yeadon, Pa.

Brother **Robert Slater, P '26,** is located in Bolinas, California. He is Shift Engineer for the Radio Corporation of America in that city.

* * *

Brother **Robert R. Osborn, L '25,** who is in the Engineering Department of the Curtiss Aeroplane and Motor Co., Garden City, N. Y., is living at 77 Magnolia Avenue.

* * *

Brother **R. R. Yehle, T '25,** is Central Office Inspector for the Wisconsin Telephone Company at Eau Claire, Wisconsin.

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Brother **Ralph E. Campbell, A '25,** is Assistant to Planning Engineer, O. H. District, Commonwealth Edison Company, 72 West Adams St., Edison Building, Chicago, Illinois.

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Brother **Martin S. Longenecker, E '25,** is taking a very illuminating course in Lighting at the Edison Lamp Works of the General Electric Company, Harrison, New Jersey.

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When not picking drifting sand out of his eyes, Brother **John H. Schmidt, E '25,** is working hard in the Electrical Department of the Gary Tube Company, Gary, Indiana.

* * *

Brother **Herman H. Wagner, N '26,** is with the Automatic Electric, Inc., 1001 W. Van Buren Street, Chicago, Ill. He is living at 513 West 4th Street, South, Newton, Iowa.

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Since June 28, 1926, Brother **Arthur G. Ferriss, P '26,** has been with the General Electric Company at Schenectady, N. Y. His new home address is 18 Pinewood Avenue.

* * *

Brother **Edward B. Graves, T '26,** is employed by the Kelley Kent Mfg. Co. of Covington, Kentucky, as a Designer. He resides at 3670 Wilshire Avenue, Hyde Park, Cincinnati, Ohio.

* * *

Brother **J. R. Eaton, B '25,** is Transmission Line Engineer for the Consumers Power Company, Jackson, Mich. He is living at 204 First Street.

* * *

Brother **Clarence H. Elder, A '25,** has also joined the ranks of the Bell System. He is with the Illinois Bell Telephone Company, Chicago, Illinois. He lives at 4537 Greenwood Avenue.

* * *

Brother **Robert Parker, B '26,** is in the Engineering Department of the Milwaukee Electric Railway & Light Company, Milwaukee, Wisconsin. He lives at the "Y."

CIRCULATION AS OF JUNE 30th FOR EACH YEAR

	1922	1923	1924	1925	1926
Alumni	719	789	1101	1200	1220
Active	363	444	476	440	486
Honorary	36	44	44	45	46
Associate	7	10	13	14	15
Exchanges	0	5	13	38	40
	1125	1292	1647	1737	1807
Total Membership	2051	2324	2600	2877	3141
Per Cent Subscribers	54.8	55.3	63.3	59.0	56.2

When You MOVE! Please Send in [THIS BLANK]

Chapter Year

Name_____

Residence Address_____

_____

Company_____

Business Address_____

_____

Position_____

Send "The Bridge" to_____

(November, 1926)

Broadcasting from CRH

C. R. HANNA

EVER heard of station CRH", you'll say. Quite naturally, for CRH is not a station. CRH is Clinton R. Hanna, age 27, out of Purdue less than five years, a Research Engineer with Westinghouse at East Pittsburgh.

Any time you're listening to your radio, however, you may be getting better reception, a clearer program, because of CRH and the improvements in reproducing apparatus to which he contributed.

That story goes back to undergraduate days at Lafayette. Hanna, as a student, developed an intense interest in radio; and, making capital out of his hobby, his thesis was entitled, "Interrupter Type of Radio Transmitter."

To carry on his experiments, it was logical that Hanna should find his way into the Westinghouse Graduate Students' Course immediately after graduation. There he received varied practical shop training. Then, in less than a year, he was busily at work on his favored radio subject at the Westinghouse Research Laboratories.

One of his accomplishments has been the development of an improved microphone. He has introduced the electrodynamic principle, in place of the condenser-transmitter type of microphone in earlier use. Hanna's development assures good quality of speech and music with greater continuity of operation than other types, because of its ruggedness and sensitivity.

For this inventive spirit and its result in microphones, Hanna's alma mater in 1926 honored him with a degree of Electrical Engineer to go with his Bachelor of Science degree of four years earlier.

And these are studies which still go on. There is no end to progress. It is because Westinghouse offers both facilities and appreciation for practical study that Research Engineers find satisfying careers in the Company's laboratories.

"What's the future with a large organization?" That is what college men want to know, first of all. The question is best answered by the accomplishments of others with similar training and like opportunities. This is one of a series of advertisements portraying the progress at Westinghouse of typical college graduates, off the campus some five —eight— ten years.

Westinghouse

WESTINGHOUSE ELECTRIC