

THE PENNSYLVANIA RAILROAD COMPANY
PHILADELPHIA, BALTIMORE & WASHINGTON RAILROAD COMPANY
NORTHERN CENTRAL RAILWAY COMPANY
WEST JERSEY & SEASHORE RAILROAD COMPANY

EDUCATIONAL COURSE



PAMPHLET—O
GENERAL INFORMATION

OFFICE OF
SUPERINTENDENT OF TELEGRAPH
PHILADELPHIA
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It is the intention of the Pennsylvania Railroad Company to prepare a series of papers on Electrical Engineering and associated subjects for the benefit of its employes interested in any work requiring a knowledge of the subject. By this it is not meant to furnish instruction papers for those who are merely curious to obtain certain information relative to the subject and who have no intention of pursuing the course and applying it to their duties.

For a person to achieve success, no matter in what line, he must study the conditions surrounding the particular case and determine how to secure the best results with the least effort and in the least amount of time. This involves a knowledge of the design, construction and operation of the equipment he is using. It is to supply this knowledge of the electrical apparatus commonly used in the operation of the railroad that these papers have been prepared.

The many applications of electricity in the every-day transaction of business have become so familiar that many of us give but little thought to the source of this power or to the reasons for the operation of the appliances controlled by it, being content with the results obtained.

The proposed course will consist of a series of instruction papers, each covering a different field, including elementary work on direct and alternating current circuits and apparatus; mathematics; mechanical and geometrical drawing; magnetism and its application to electric generators, motors, measuring instruments, telephone, telegraph, signal, lighting, traction and general electrical equipment; common trouble developing in each type of apparatus; methods of locating and adjusting or clearing it.

The following papers will be issued in about the order mentioned:

Primary Cells.

Elementary Electricity; Direct Current.

Elementary Mathematics; Arithmetic.

Magnetism; Electromagnets and the Theory of Generators and Motors.

Storage Batteries; Lead and Nickel Types.
 Geometrical Drawing and Problems on Plane Figures.
 Logarithms; Use and Table.
 Measuring Instruments; Principle, Uses, Connections and
 Trouble.
 Physics; Light, Heat and Sound.
 Generators and Motors; D. C. and A. C.
 Telephone and Telegraph Apparatus.
 Train Dispatching Apparatus.
 Signal Equipment.
 Transformers; Theory, Design, Connections and Trouble.
 Arc and Incandescent Lamps; Theory, Types and Efficiency.
 Electric Traction.
 Power Plant Design and Apparatus.

It will not be necessary for one to study all of these in the order mentioned unless desired. The elementary papers and those in which the student is especially interested may be studied.

These papers will be as practical as possible and touch upon a sufficient amount of theory to explain the principles of operation of the different equipment.

The various papers issued are not for sale. They will be furnished free of charge to employes of the Pennsylvania Railroad Company only, with the understanding that they may be kept for future reference.

If at any time the student wishes to study more extensively any particular subject covered by these papers, a list of books will be furnished which will be of assistance in making this study. These may be secured through the office of the Superintendent of Telegraph.

The reading of trade papers, that is, technical periodicals having direct reference to that branch of the science in which the individual is particularly interested, is encouraged. A progressive employe lets no opportunity slip for improving himself and adding to his store of information concerning his line of business. Not only is the individual in touch with any new devices which are being developed in his particular line, but he also learns of what trouble others are having and how they are able to clear it.

Ideas obtained from studying these papers should be put to a practical test at the first opportunity afforded, as it is only with

the combination of theory and practice that this study will be of value either to the individual or to the Company.

The papers may be sent out one at a time, or two or more, depending upon conditions. When two or more are sent at one time it is to be understood that they are closely associated with each other and should be studied together. The method to be pursued should be to read over all of these papers received at any time before giving any of them serious study, in order to see in a general way what is covered by the papers and how they are associated with each other. Then study them individually until the contents are well understood. If there are any statements made or any terms used that are not clear, or any questions that may be suggested in connection with the work of any individual having a direct bearing upon the subject in question, it should be taken up with the office of the Superintendent of Telegraph, where it will be given due consideration.

Do not endeavor to study too long or too hard at any one time, and do not attempt to absorb facts after they begin to appear hazy. Study at regular intervals if possible, say a half-hour or an hour a day, and surprising results will be obtained; in fact, more will be accomplished than by trying to do a great deal at once and then leaving it for a considerable length of time.

It is possible that some of the papers will seem hard or difficult, but this fact alone indicates that the student possesses a lack of information on those particular subjects, and they should be studied carefully and thoroughly.

Each paper will be accompanied by a number of questions or problems which cover a certain amount of the subject-matter of the papers, but not all of it. If only enough is studied to answer the questions, then much that is of value will be overlooked. Therefore, all should be studied carefully to get the most out of them. Much information will be contained in these papers that will be valuable for reference; and next to knowing a thing is knowing where to find it.

When it is found that all the questions can be readily answered, these answers, but not the questions, should be written out and mailed to this department. These papers will then be corrected, marked and returned. The corrected papers should be carefully studied in case that the student has formed the wrong idea concern-

ing the points in question. When the marks obtained are below 75 per cent. the subject-matter covered by the questions on which the student failed should be studied over again carefully. If requested, these questions should be answered again, but not those previously answered correctly.

For the convenience of the student, we have attached to this pamphlet a blank form upon which a complete record of papers received, answered, grades obtained, etc., should be kept.

The answers may be written with a typewriter, pen or pencil upon the regular Company letter-size paper, if available, or, if this cannot be readily secured, any size which the student may have.

Write only on one side of a sheet in a plain hand and with the lines not too close together, leaving a margin of at least one inch at the left of the sheet. This will make it possible for corrections to be easily made.

The spelling and grammar will not be taken into consideration in grading the papers, but it would be for the benefit of the student to exercise care in preparing the answer papers. Would recommend that the student also pursue studies in other branches, such as English, stenography, etc., if possible.

Each student will be given a reference number, and when sending in answers to questions or any correspondence, always place this reference number in the upper right-hand corner of each sheet. If more than one sheet is included, number them consecutively, your name and address, also name and number of the paper being answered, on the top of the first sheet.

The Superintendent of Telegraph should be notified of any change in address, position, or transfer to another division, to prevent delays in the work.

The regular railroad service mail will be used for the transfer of all papers and correspondence from and to the students.

If the student is not in the office or station to which this mail is sent, arrangements should be made there for notice to be sent him when such mail is received.

The grades shown on the returned papers will have no other significance than to show how satisfactorily the student is doing his work.

If, for any reason, the marking of the papers is not understood, the question should be taken up with the Superintendent of Telegraph, returning the papers with your letter.

There is no specified time when the answers to the questions contained in the various papers must be returned. It would be more satisfactory to all concerned if the student understands thoroughly the contents of the papers before attempting to formulate the answer rather than to try to rush through them sooner than someone else.

The primary object of placing this course in the hands of all interested employes of the Pennsylvania Railroad is to better the service by educating the men and thereby making their work easier.

By making it free, although prepared at considerable expense to the Company, it is thought that a greater number would take advantage of the course for their own improvement, which is bound to result favorably both for the individual and for the Company.

Any individual who will devote an hour regularly every night to the study of business conditions, and especially to the things that he can find to read about his own business, will find that the knowledge thus acquired in advance of the time when it seems to be necessary will be needed much sooner than expected. This principle of anticipated knowledge seldom fails.

A pamphlet called the "Question Box" will be issued at certain intervals for the benefit of those studying the course. Any practical questions which may occur to the student when studying these papers and which have a bearing upon the work will be gladly received. These questions, together with the answers, but without the name of the individual, will be published and sent out when convenient. This is a good way to find out the cause of some of the disagreeable and annoying things that have been causing trouble and possibly worry. Give as complete details as possible regarding the question or trouble, in order to save correspondence later. By co-operating heartily in this, the work of each may be made interesting to all.

