practical resources with the electrical engineer. This field is that of great electro-motive force, and I, therefore, thinking that it is important at this stage of the development of electricity to take advantage of the many practical improvements in dynamos and electrical circuits for the furtherance of the study of electrical pressure, have had installed in the Laboratory the most powerful apparatus for this purpose in the world.

The plant consists of 20,000 storage cells giving 40,000 volts or electrical units of pressure; and this can be augmented to 3,000,000 volts. In the construction of this powerful plant it was found that this limit of 3,000,000 of volts could not be exceeded as long as the apparatus is situated in a building, for the inductive action of the walls and the floors is so great that a serious loss results. In order to obtain the full effect of 3,000,000 volts the apparatus should be placed in the center of Holmes field and should be raised at least thirty feet from the ground. This great electrical plant opens a wide field of scientific inquiry. It enables one to study by spectrum analysis the effect of intense heat on gases and the vapor of metals; for by means of this battery one can produce the highest degree of instantaneous temperature yet attained. I am at present investigating the spectrum of hydrogen in the hope of obtaining some clue to the conditions of temperature in the stars. The plant also furnishes the ideal method of producing the X-rays. A Crookes can be made to glow with perfectly steady light giving out the X-rays with intense brilliancy and affords strong contrasts which have long been desired. For surgical purposes a steady source of these rays is of the utmost importance. All the methods in present use produce the rays by a more or less fluctuating process, whereas the method I have adopted is by the use of a steady current of electricity from a battery constantly in one direction. This current can be regulated to any desired degree. The result has never been accomplished before.

The interesting fact that a steady current at 40,000 units of pressure or volts is so efficient in producing the X-rays leads me to believe that a plant similar to the one in the Jefferson Physical Laboratory, but of much smaller dimensions—having the same number of cells but smaller ones—may be a desirable adjunct to a great hospital.

THE NEW YORK STATE COLLEGE OF FORESTRY.

The College of Forestry of Cornell University has made provision, as has been already stated in this Journal, for a course of lectures on 'Fish and Game Protection and Fish Culture' as a regular part of the curriculum, and Dr. Barton W. Evermann, Ichthyologist of the U. S. Fish Commission, has been selected as special lecturer to give the course. The instruction will consist of laboratory work and field excursions, together with lectures upon the life-histories of food and game fishes, their artificial propagation and protection; the relation of the forests to the streams and lakes and their inhabitants; the proper care of streams and lakes with reference to forestry, logging, lumbering, milling, mining and irrigation operations; and the value and protection of the mammals and birds of the forest.

Dr. B. E. Fernow, the Director of College of Forestry, properly considers that the forester should know not only how to care for the forest proper, but that he should understand that the protection of the denizens of the forest and the streams and lakes within the forest, and their inhabitants, also, constitute a legitimate and important part of his work.

The graduates of the College of Forestry are the men who will be called to the management of the National Forest reservations and the large private forest properties, and it is gratifying to know that they will enter upon their work with the broad and rational view of their duties and their opportunities.

This course was first given to the juniors and seniors of the present year at Axton, N. Y. (where the State College Forest is located) during the second and third weeks in May. Hereafter the course will be considerably lengthened in time and made more comprehensive in character.

Dr. Fernow will receive the thanks and congratulations of all persons interested in the preservation of our forests and the protection of the inhabitants of the forest and the forest

waters for the successful inauguration of this interesting and important phase of forestry instruction.

The value of the extensive timber investigations planned and carried on by Dr. Fernow, when Chief of the Division of Forestry, U. S. Department of Agriculture, is more and more appreciated by practitioners and investigators, as the results become better known. One of the important results was the discovery of the relation between the strength of a beam and of a column of the same material, which was deduced and mathematically developed by F. E. Neely, C.E., from the many thousand tests made on comparable material during the extended general test series.

This winter, Professor C. A. Martin and Mr. George Young, Jr., both of the College of Architecture, Cornell University, have, under the auspices of Professor F. Roth, of the New York State College of Forestry, in connection with the course on Timber physics, carried on a series of tests, published in *Engineering News*, that furnish experimental proof of the correctness of this relation, which is that the strength of a beam at the elastic limit is equal to the strength of the material in endwise compression.

In other words, if we wish to know what load a beam will carry without injury to its elastic properties, we only need to test the material in compression to failure; the load which accomplishes the failure is also the extreme load for a beam strained to the elastic limit.

The practical value of this discovery is readily seen: A simple test in compression gives, without the introduction of difficult formulæ, immediate answer to the practically important question of the beam strength to safe limits.

The tests also remove any doubt as to whether wood possesses a definite elastic limit, which, although less pronounced than in metals, is, nevertheless, readily recognized.

THE FORTHCOMING MEETING OF THE BRITISH ASSOCIATION.

THE issue of *Nature* for June 14th contains an article by Mr. Ramsden Bacchus giving an account of the plans for the Bradford meeting of the British Association from which we take the following particulars:

The meeting promises to be an unusually large and important one. Bradford being midway between London and Edinburgh, serves as a common meeting ground for scientific men from the south of England and from Scotland and Ireland, and it is within easy reach of the Midland and Northern University Colleges. Bradford and Leeds are so close together that for such a purpose as this they are almost one city, and the Bradford Committee, therefore, have the advantage of the Yorkshire College being practically on the spot. The last meeting of the British Association in Bradford was held in 1873, but since that time the city (which, by the way, was then only a town) has practically been rebuilt, and has grown and developed in a manner resembling the progress of an American rather than that of an English town.

It is probable that the number of visitors will be far above the average; already some sixty or seventy Fellows of the Royal Society have announced their intention of being present, and professors and eminent lecturers from nearly every university in England, Scotland and Ireland have promised to attend. The Church will be represented by the bishop of Ripon, the legal profession by the Master of the Rolls and Lord McLaren, and the names of over a score of members of both Houses of Parliament have been sent in.

The meeting will commence on Wednesday, September 5th, when the new President, Professor Sir Wm. Turner, of Edinburgh, will deliver his address in St. George's Hall. On the following evening the Mayor of Bradford will give a conversazione in St. George's Hall, at which it is hoped there will be exhibits illustrating the most recent scientific work. On Friday evening the lecture will be delivered in St. George's Hall by Professor Gotch, F.R.S., on 'Animal Electricity.' The lecture to artisans on Saturday will be given by Professor Silvanus Thompson, F.R.S., and it is expected that there will be an audience in St. George's Hall of 4000 to 5000 working men. On Monday afternoon the Mayor and Corporation will give a garden-party in Lister Park, and in the even-