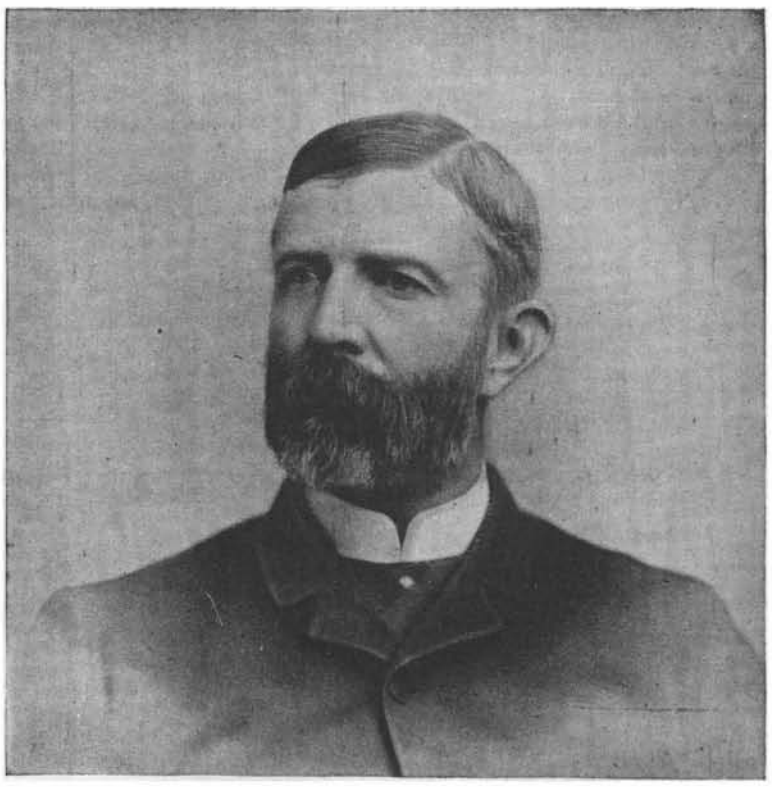
GEORGE LINCOLN GOODALE.

The American Association for the Advancement of Science celebrates this year the fiftieth anniversary of the organization of the Association of Geologists and Naturalists, from which it has descended. Last August, under the presidency of Thomas C. Mendenhall, the superintendent of the United States Coast and Geodetic Survey, it met in Toronto, but this year it returns to its native soil and gathers its members in Indianapolis for a second time, having previously, in 1871, convened there. The office of president rotates from the physical sciences to the natural sciences, and the able representative of the former class gives place this year to a distinguished botanist.

Professor Goodale was born in Saco, York County, Me., on August 3, 1839. Early in life he seems to have had distinct leanings toward science, for after completing his academic studies he took a practical course in pharmacy. He then entered Amherst College, and was graduated there in 1860. During a portion of the subsequent year he remained at college as assistant in chemistry and botany, pursuing private studies in the latter subject, under the direction of Professor Edward Tuckerman, the most distinguished lichenologist this country has ever seen. He then studied at the Harvard Medical School, whence, in 1863, he received the degree of M.D., and also in the same year received a similar degree from the Medical School of Maine, a department of Bowdoin College. Settling in Portland, Me., he there began the practice of his profession, and at the same time served as instructor of anatomy, materia medica, and surgery in the Portland School for Medical Instruction, receiving also, in 1864, the appointment of State Assayer of Maine. His health having become impaired, he made a sea voyage, in 1866, to Panama for its recovery, and returned by way of California, Nevada, Oregon, Washington, Idaho, Utah, and Colorado. In 1868 he was appointed professor of applied chemistry in Bowdoin College, and later instructor of materia medica in its medical school. Professor Goodale was transferred, in the following year, to the Josiah Little professorship of natural science, and also became a member of the State Board of Agriculture.

These various connections he resigned in 1872 to accept the place of instructor in botany at Harvard College, where he also became University lecturer on vegetable physiology. Since then he has been connected with the botanical work of this university. In 1873 he was made assistant professor of vegetable physiology, and five years later professor of botany. On the death of Asa Gray in 1888, he was chosen to succeed that distinguished scientist as Fisher professor of natural history, which chair he still fills. He has also been director of the Botanic Garden since 1879, and since 1881 he has been a member of the faculty of the Museum of Comparative Zoology of Harvard University. Besides these many duties he is a member of the council of the Harvard University library.



GEORGE LINCOLN GOODALE.

Professor Goodale's publications have been physiological and botanical. Soon after his appointment at Harvard he delivered a lecture on "Hybrids and Hybridization in Plants," and one on "Recent Researches in Regard to Seeds and their Germination," which were published in the "Annual Reports of the Massachusetts Board of Agriculture." He contributed the articles on "Vegetable Histology" and "Vegetable Physiology" to "Johnson's New Universal Cyclopedia," and in 1879 published his "Concerning a Few Common Plants." The text of the "Wild Flowers of North America," a quarto published in parts, with beautiful plates by Isaac Sprague, was written by him. He is also the author of "Practical Exercises in Histology and Vegetable Physiology" (New York, 1885) and of "Vegetable Histology" (1885) and "Vegetable Physiology" (1885). The two last named, with additional matter, have been combined under the title of "Physiological Botany," to form the second volume of Asa Gray's "Botanical Text Book" (1885). At present he is occupied with the preparation of an extensive treatise on "Economic Botany," illustrations of the useful products of plants in the Harvard University museum. A compedium of this work will be published in the series to which his "Physiological Botany" belongs. Professor Goodale is also associate editor of the *American Journal of Science*, the duties of which came to him on the death of Dr. Gray.

Of honors he has a fair share. The degree of A.M. has been conferred on him by Amherst and Bowdoin colleges, while the former at its recent commencement again honored him by conferring the degree of LL.D. upon him. He is a member of the Deutschen Botanischen-Gesellschaft in Berlin, also of the American Society of Physiologists and the American Society of Anatomists, while he has recently held the presidency of the Society of American Naturalists. Besides honorary or corresponding relationship to the Philadelphia Academy of Natural Science and the New York Academy of Sciences, he is one of the seven fellows in botany of the American Academy of Arts and Sciences. At the spring meeting held this year of the National Academy of Sciences, he was one of the four new members admitted to that distinguished body.

Professor Goodale joined the American Association for the Advancement of Science at the Salem meeting, held in 1869. He was advanced to the grade of fellow in 1875, and in 1888 was elected vice-president over the section on biology. At the Toronto meeting last year he delivered his address entitled "Protoplasm of Living Matter," in which he discussed the investigations made upon cellular tissue from the year 1667 down to the present time. At the close of the meeting he was chosen president of the association, and will preside at the forthcoming gathering.

White Lead by Electrolysis.

The new electrolytic process for the production of white lead is now in practical operation, and there appears to be no doubt of its commercial success. Estimating its production in expenditure of horse power, 152 pounds per day per horse power, or 27½ tons per year, is the result. The process may be briefly described as follows, employing technicalities as little as possible:

A solution is first prepared by dissolving sodium nitrate and ammonium nitrate in water in the proportion of 1 gallon of water to ½ pound of each of the nitrates. This solution must be saturated with carbon dioxide, which is best obtained by burning limestone, washing the gas thus produced, and supplying this gas directly to the solution while in the tank and subjected to the electrolytic action. After the solution has been placed in the tank, electrodes of metallic lead are immersed in it, and an electric current from a generating dynamo passed between them through the solution, and pure white lead is rapidly precipitated by the action. From time to time the white lead is removed, washed and dried, and may then be mixed with a suitable article to form paint. The supply of carbon dioxide must be maintained throughout the operation.

The white lead thus formed by electrolytic action, besides being produced more cheaply than heretofore, is found to have greater covering properties and to go further in actual use. Moreover, not the least valuable feature of this invention is that it substitutes an innocuous process for the very injurious operation of dissolving lead in acetic acid in the presence of carbonic acid. Thus electricity has added another boon to mankind. The discoverer of the process is Mr. Turner D. Bottome, of Hoosick, N. Y., U. S. A.

What is Invention?

The late Judge Hall, of the Circuit Court of the United States, says: "An invention, in the sense of the patent law, means the finding out, the contriving, the creating of something which did not exist and was not known before, and which can be made useful and advantageous in the pursuits of life, or which can add to the enjoyment of mankind. In other words, the thing patented must be new; and it must be useful to an appreciable extent, though the measure of that usefulness is not material. Any degree of utility appreciable by a jury is sufficient, upon the question of utility to sustain a patent."

Steam Engine Economy, Thurston's Process.

Among recent inventions which we have had opportunity to promote, we note one which has for its object the further improvement of the steam engine by the reduction of those internal and once mysterious wastes which are now known to constitute the most important part of the avoidable losses of heat and of steam in the engine, and which, unlike the thermodynamic wastes, are due to defects of the machine itself, and not of the process of heat and power conversion, defects of the cycle which must be adopted in its operation. In a paper recently read before the American Society of Civil Engineers, by Professor Thurston,* we find an account of the experiments made under his direction in the laboratories of the Sibley College of Cornell University to determine the efficiency of his process of treatment of the interior of the engine, with a view to securing less conductivity and heat-storing power, and thus of reducing the wastes and of increasing the efficiency of the machine.

The process is described at length in a patent which our readers have seen recorded already, among our notes of recent inventions, and consists of the following simple operations: The interior surfaces, such as are not acted upon by rubbing parts, the heads of the cylinder and the sides of the piston, and where practicable the ports of the engine, are first subjected to prolonged action of very dilute acid, like foundry "pickle" for example. This, if sufficiently dilute and if the treatment be sufficiently prolonged, has the effect, familiar to those of our readers who are familiar with the operation of condensing engines, as sometimes observed in the channel ways and other parts exposed to the wash of the warm water discharged from the condenser through air pump and hot well, that process which is sometimes, though improperly, described as "conversion into plumbago." The material so produced as surface covering is really, as shown by analyses made by Dr. Thurston many years ago, and at the time reported in the SCIENTIFIC AMERICAN, a mass of fine sponge of mixed iron oxide and metallic iron, of which the pores are filled by the graphite originally present as a constituent of the iron now dissolved out by the acid. Such a sponge will take up a certain portion of any fluid, and the sponge thus saturated becomes a comparatively good non-conductor for heat and a very poor storehouse for caloric. A surface thus protected can no longer act efficiently in receiving and storing heat, and it thus becomes impossible for the interior of the engine, where thus treated, to take up heat from the entering steam in as large quantities as before, and the waste is thus reduced, just in proportion as the conductivity and heat-storing power are by this method diminished.

The treatment with acid alone reduces the wastes considerably; but the addition of the coating of resin produced by the application of a drying oil is found by the inventor to be a very important gain. It was found that even a single application of the oil, with but twenty-four hours' drying, reduced the waste about *forty per cent.* Since the wastes in the ordinary engine seldom fall under one-fourth the total amount of steam supplied, and frequently are enormously greater, it is obvious that, should this, or an equivalent, process prove practically successful, the gain is likely to prove of serious importance.

Other experiments are in progress, and other researches are planned, looking toward a more complete investigation of the subject. We have also in our hands the papers exhibiting the details of other and what are anticipated to be still more perfect methods, devised by the same inventor, for securing these economies; and it is thought very possible that, in time, advances in the economy of the steam engine, through the use of these or other processes, may be chronicled which will give the steam engine another lease of that life which has been threatened by the advocates of the other motors. An extensive laboratory investigation will give, in time, a scientific basis for computation; and the experience of the builders of engines about to be thus constructed and treated will give a practical test of the real value of the invention.

Palpitation of the Heart.

Dr. Nebo (in *Journal de la Sante*) says that an excessive palpitation of the heart can always be arrested by bending double, with the head downward and the hands pendent, so as to produce a temporary congestion of the upper part of the body. In almost all cases of nervous or anemic palpitation, the heart immediately resumes its natural function. If the respiratory movements be suspended during this action, the effect is only the more rapid.

* Cresson meeting, June, 1890.