

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1891, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXIV.—No. 13.
ESTABLISHED 1845.

NEW YORK, MARCH 28, 1891.

\$3.00 A YEAR.
WEEKLY.

THE BOYNTON UNICYCLE RAILROAD.

During several weeks last summer there were in regular and continuous operation, in railway passenger service, the locomotive and cars shown in the lower view herewith presented, the service being between Gravesend and Coney Island, on an abandoned section of an old standard gauge track of the Sea Beach and Brighton Railroad. The locomotive weighs nine tons, and has two 10 by 12 inch cylinders, the piston rods of both being connected with cranks on each side the single six-foot driving wheel, and the front of the locomotive being also supported by two 38-inch pony wheels, one behind the other. These wheels have double flanges, to contact with either side of the track rail, as also have similarly arranged pairs of 38-inch wheels arranged under and housed in the floors near each end of the cars.

In the upper view is shown an improved locomotive especially designed for this method of traction, and built for use on a street railway of a Western city. It weighs sixteen tons and has a pair of five-foot drivers. The crank is only seven inches in length, and the engine is designed to readily make 600 revolutions a minute, and maintain a speed of 100 miles an hour with a full train of passenger cars. The first Boynton locomotive, described in the SCIENTIFIC AMERICAN in September, 1889, had an eight-foot driving wheel and weighed 23 tons. It proved too heavy for use on the

old Coney Island road, although it was undoubtedly capable of making very high speed and easily drawing a heavy train of single-wheel cars on a properly arranged track.

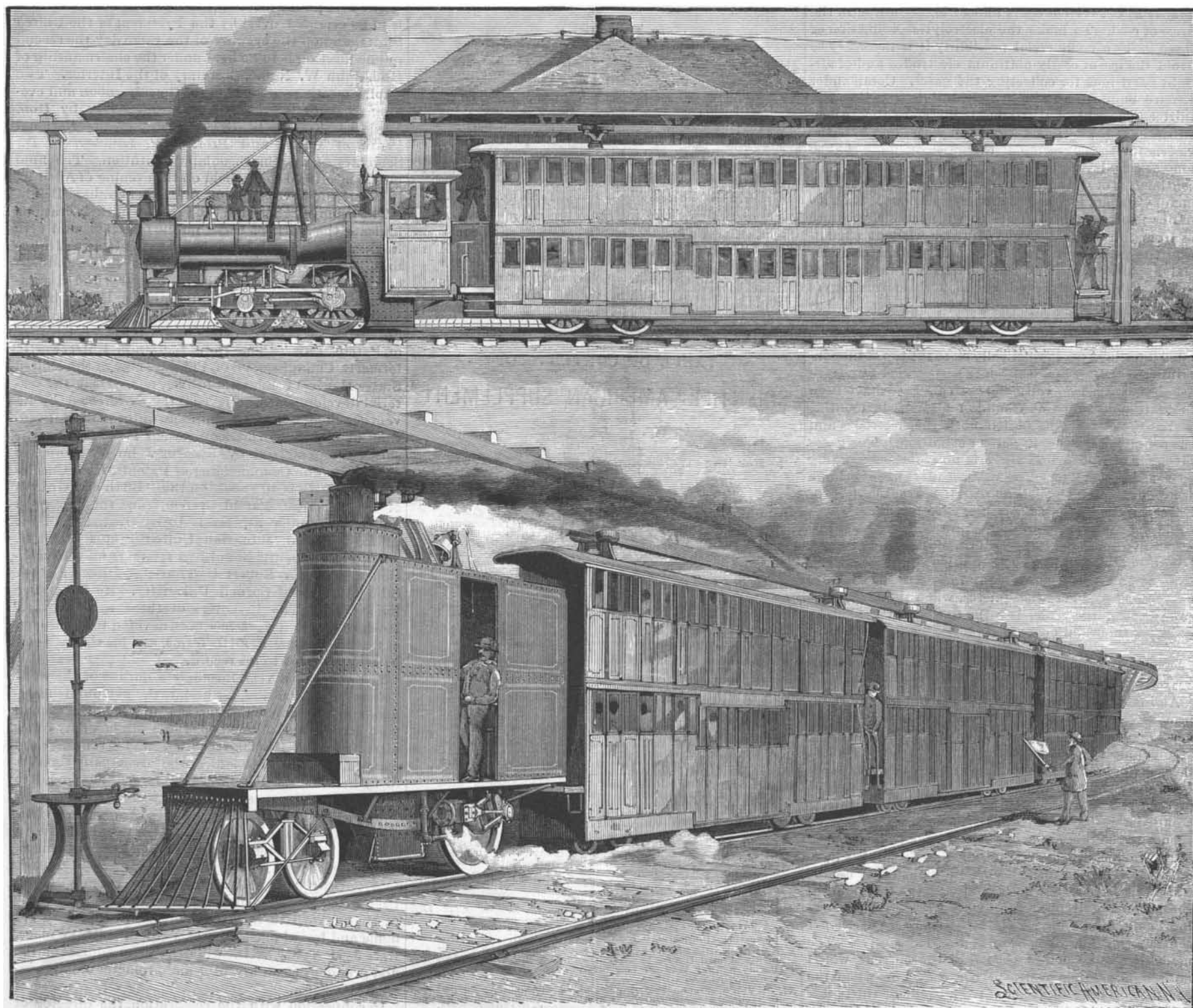
In a true line with, and fifteen feet directly above, the face of the track rail is the lower face of a guide rail, supported from posts arranged along the side of the track, and on the sides of this guide rail run pairs of rubber-faced trolley wheels attached to the top of the locomotive and the cars. The guide rail is a simple stringer of yellow pine, $4\frac{1}{4}$ by 8 inches in section, and the standards on which the trolley wheels are journaled are placed far enough apart to allow a space of six inches between the contiguous faces of each pair of wheels, thus affording $1\frac{1}{4}$ inches for lateral play, or sidewise movement toward or from the guard rail, it being designed that the guide rail shall be arranged in the exact line of the true center of gravity of the cars and locomotive. The standards are bolted to six-inch wide strap iron attached to and extending across the top of the car.

The switching arrangement is remarkably simple. In addition to an ordinary track switch, in which, however, the switch bar is made to throw only one rail, a connection is made by means of a vertical rod and upper switch bar with a shifting section of the guide rail, whereby, on the moving of the track rail and the setting of the signal, the guide rail will be

simultaneously moved, the adjustment being effected and both being locked in position according to the methods usual in ordinary railway practice.

The cars, as will be seen, are each two stories in height, each story being divided lengthwise into nine separate compartments, each of which will comfortably seat four passengers, thus providing seats for seventy-two passengers in each car. Each compartment has its own sliding door, and all the doors on the same floor of the car are connected by rods at the top and bottom with a lever in convenient reach of the brakeman, by whom the doors are all opened and closed simultaneously. The compartments are each four feet wide and five feet long, the seats facing each other. Only one rail of the old single track was used, as only one guide rail had been erected, except at the ends of the route, for switching purposes, but the width of the cars and motor was such that it only required the erection of another guide rail, for the utilizing of the other track rail, to form a regular double-track road of the Boynton pattern.

The section of road on which this system has been operated is only $1\frac{3}{4}$ miles long, in which distance the curves are considerable, but, although they are mostly in one direction, the indications of wear upon the traction wheels, and upon the guide rail and trolley wheels, were hardly perceptible. During a portion of the season, when the summer travel to Coney Island



THE BOYNTON UNICYCLE AND SINGLE-RAIL TRACK RAILROAD, FOR HIGH SPEED TRAFFIC.

was at its height, trains were run on regular schedule time, fifty three-car trains daily each way, carrying from one to three hundred passengers per trip. The regular time taken for the run was three minutes, but special trips were made in two and three-quarter minutes each, including starting and stopping. The daily consumption of coal in performing this service was but half a ton. The great economy of this method of traction is also evidenced by the smoothness with which the cars run, and the entire absence of side motion and vibration, there being no striking and grinding of the wheel flanges upon the rails, as is common on double-track roads. From a seat in the top part of the tender, where one could observe how the trolley wheels followed the guide rail, it was noticed that frequently, for considerable distances, these wheels did not touch the guide rail at all on either side, and when they did approach and bear upon the guide rail it was with a gently swaying movement, indicating no expenditure of power at this point, and apparently having no effect upon the motion of the car. This was, of course, to be expected, in this system of locomotion, when a high speed is attained, and it is upon this point that the claim is made by the advocates of such systems, that in this way only is it possible to obtain greatly increased speeds on railways with the present styles of motors.

Hydrogen and Oxygen Produced by Electricity

In a paper recently read before the Société Française de Physique Commander Renard described his investigations on the electrolysis of water on a commercial scale, which he commenced as far back as December, 1887. Taking the counter E. M. F. at one and five-tenths volt, and the total plant efficiency at only 50 per cent, thirty-five and three-tenths cubic feet (one cubic meter) of hydrogen can be produced for every ten horse-power hours; and taking the coal consumption at two and two-tenths pounds (one kilogramme) per horse-power hour, the cost of fuel for every thousand cubic feet at atmospheric pressure of the mixed gases comes out in France at between 32 cents and \$1.20, according to the price of coal. To make the electrolytic production of these gases a commercial possibility it is necessary to avoid the use of costly platinum electrodes and of airtight partitions for collecting the gases. Commander Renard employs an alkaline electrolyte (caustic soda, thirteen per cent solution) and is therefore able to substitute cheap cast iron electrodes for platinum. As to the vessels for the collection of the gases, he finds that so long as they have a *capillary reaction* Δ equal to a few centimeters of water, the hydrogen and oxygen do not mix. Commander Renard employs porous pots of asbestos fiber, which are able to withstand a pressure of from thirty to fifty cms. of water without permitting the passage of the gases. The actual commercial apparatus used at the Chalais works is as follows: A large cylinder of common sheet iron serves at the same time as the containing vessel for the electrolyte and as the negative electrode. The positive electrode is a perforated iron tube, fixed on to an insulated lid, which fits hermetically on to the top of the containing vessel. This electrode is surrounded by a large asbestos bag. Two voltmeters of this kind have been in continuous work at Chalais for some six months, and at the end of this period both the electrodes and the asbestos bag were in perfect condition. The gases given off are pure, and there is no ozone. According to Commander Renard, a battery of thirty-six large voltmeters could generate about 200 cubic feet of hydrogen and 100 cubic feet of oxygen per hour, which could be compressed to a pressure of from 120 to 200 atmospheres in steel tubes, and utilized for therapeutic, laboratory, metallurgical, and other purposes. The total cost of these gases, ready for use in steel bottles at a pressure of 120 atmospheres, when produced on a sufficiently large scale, is estimated at from \$2.92 to \$3.54 per thousand cubic feet.

Electrical Welding of Wheels and Rails.

An invention is now undergoing investigation which promises the improvement of railway traffic. The invention consists of a small dynamo and an auxiliary engine placed upon the locomotive in such a way as to be easily operated, furnishing a current of small force but large quantity, which is made to pass from one pole of the dynamo to one pair of driving wheels, thence along the rail to the other pair of driving wheels, thence to the other pole of the dynamo, thus forming a traveling circuit, moving at all times with the locomotive. By means of this current an incipient weld is caused between the wheels and rails at the point of contact, preventing the slipping of wheels. The working model of the device shows an increase of 400 per cent in the hauling power of the locomotive. The model without the application of the current would not mount a grade of fifteen per cent, but when the current was applied, it mounted a grade of thirty-five per cent. A locomotive is now being equipped with the invention to test it on the Baltimore and Ohio Railway.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico. \$3 00
One copy, six months, for the U. S., Canada or Mexico. 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for U. S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus last page.
Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, nine dollars a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. It has the largest circulation of any architectural publication in the world.
Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$6.00 a year. To foreign countries, \$11.50 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial, trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. \$3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO. Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, MARCH 28, 1891.

Contents.

(Illustrated articles are marked with an asterisk.)

Aluminum overrated.....	197	Monuments, Chaldean, in London.....	195
Arches, slanting, ancient.....	194	Notes and queries.....	202
Beer drinking in the U. S.....	198	Oxalic acid from sulphite liquor.....	202
Beetle, water, the.....	193	Park, a new proposed, for New York.....	198
Books and publications, new.....	232	Patent system centennial.....	192
Canal enterprises, present.....	201	Patents granted, weekly record of.....	203
Chinese can sing.....	194	Planets, position of, in April.....	193
Cholera and snake bite.....	199	Railroad, unicycle, single track, Boynton.....	191
Commutators, slings.....	194	Railway, cable, crossing, Orr.....	195
Copper sulphate.....	194	Railway, electric underground, London.....	197
Electric meters, cheaper, wanted.....	198	Sewer, an ancient.....	194
Electric underground railroad, London.....	197	Soapstone or talc.....	196
Electricity producing hydrogen and oxygen.....	192	Specify gravity of fluids, experiment.....	201
Electricity, source and force of.....	194	Steam navigation, early history.....	191
Engineers must study.....	193	Tuberculosis, Prof. Lieberich's remedy for.....	199
Fish habitation, a.....	199	Type-setting machine patent decision.....	194
Food adulteration law, Belgian.....	196	Vaulting, Oriental method of.....	201
Granite, a large block of.....	195	Wagon rack clasp, Salisbury's.....	194
High places in the world.....	201	Welding, electric, wheels and rails, and drawings.....	192
Horse breeding, New South Wales.....	196	Whiffletree device, Allen's.....	195
Horse, what a, would say.....	194		
Inventions, recently patented.....	202		
Lamps, incandescent, life.....	194		
Literary relic, interesting.....	195		
Mashed drawings, interesting.....	195		
Milk of the Egyptian buffalo.....	199		

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 795.

For the Week Ending March 28, 1891.

Price 10 cents. For sale by all newsdealers.

I. AVICULTURE.—The Effect on Fowls of Nitrogenous and Carbonaceous Rations.—A very valuable report upon the effects of different diet on chickens, with tables of data.—1 illustration.....	12769
II. BIOGRAPHY.—N. F. Burnham and his Life Work.—By W. H. BURNHAM.—The life of one of the earliest turbine wheel manufacturers, an inventor of turbine wheels and auxiliary machinery.—1 illustration.....	12701
III. BOTANY.—The Source of Chinese Ginger.—An identification of a long unknown plant.....	12697
IV. CIVIL ENGINEERING.—A Railway through the Andes.—An interesting enterprise now in progress in South America, with maps.—2 illustrations.....	12699
Chicago as a seaport.—Proposed connection of Chicago with the waters of the Mississippi River, thereby placing it in water communication with the sea.—2 illustrations.....	12700
Floating Elevator and Spoil Distributor.—A machine for removing dredged material from barges, as employed on the Baltic Sea Canal Works.—10 illustrations.....	12693
V. ELECTRICITY.—Alternate Current Condensers.—A valuable review of the difficulties of constructing these condensers.—An important contribution to the subject.—1 illustration.....	12702
Electricity in Transit.—From Plenum to Vacuum.—By Prof. WILLIAM CROOKES.—Continuation of this important lecture, with profuse illustrations of experiments.—14 illustrations.....	12704
The Telegraphic Communication between Great Britain, Europe, America, and the East.—By GEORGE WALTER NIVEN.—The engineering aspects of electricity.—The world's cables and connections.—2 illustrations.....	12702
VI. HORTICULTURE.—Herbaceous Grafting.—A hitherto little practiced and successful method of treating herbs, with curious results.....	12710
VII. MECHANICAL ENGINEERING.—Improved Cold Iron Saw.—The "Demon" cold saw for cutting iron.—Its capacity and general principles.—1 illustration.....	12699
VIII. MEDICINE AND HYGIENE.—How to Prevent Hay Fever.—By ALEXANDER ELIXA.—A systematic treatment of this very troublesome complaint, with a special prescription and other treatment.....	12697
IX. MISCELLANEOUS.—The Business End of the American Newspaper.—By A. H. SEGFRIED.—A graphic presentation of the technique of the newspaper office, circulation of the American papers, methods of printing, etc.....	12635
The New Labor Exchange at Paris.—A new establishment, long demanded by the laboring population of Paris.—Its scope and prospects.—2 illustrations.....	12635
X. NAVAL ENGINEERING.—The Empress of India.—The pioneer of a fast mail service to ply in connection with the Canadian Pacific Railway between Vancouver, China, and Japan.—1 illustration.....	12700
XI. PHYSICS.—Stereoscopic Projections.—A most curious method of securing stereoscopic effects with the magic lantern upon the screen, involving the use of colored spectacles by the spectators.—1 illustration.....	12708
XII. TECHNOLOGY.—Gaseous Illuminants.—By Prof. VIVIAN B. LEWES.—The fifth and last of Prof. Lewes' Society of Arts lectures, concluding his review of the subject of gas manufacture.....	12705

THE CELEBRATION OF THE BEGINNING OF THE SECOND CENTURY OF THE AMERICAN PATENT SYSTEM.

The coming month is to witness the celebration of the Beginning of the Second Century of the American Patent System. On April 8, 9, and 10, a grand convention of all who appreciate the value of the American patent system is called to meet at Washington, D. C. The programme, lists of committees, names of speakers and subjects of their addresses have been published. The occasion is an impressive one; the personnel of the meeting, it is not too much to say, seems to rise to the occasion. Without the encouragement of the patent system the inventors of America would never have worked as they have in the past. With no statutory right to the fruits of their intellectual toil they would never have appeared on the scene as the moving force in so many parts of the commercial, agricultural, and mechanical world. The gathering at Washington of the leading scientific and mechanical workers of the age and race, the oral exposition of the law and statistics of invention, of the science and practice of invention and of its specific applications, the interesting collections in science and art, and the historical models of inventions which will be produced, all co-operate to give the occasion an importance not exceeded in the case of any convention ever held in Washington.

Our views on the maintenance of the rights of the inventor and on the preservation of the force of the Patent Statutes are known, and have often been recorded. In this convention, to include the best minds of the day among its active participants, we recognize a tribute to the inventor and an auxiliary in the defense of his rights. The voices and opinions of the old-time federal judges, upholding the dignity of the inventor and his vital importance to America, will be re-echoed in no uncertain tones during the three days of commemoration. A chance will be afforded our legislators to hear the just views of the nation's thinkers upon the patent system. A barrier will be opposed to future attacks upon it, and the moral force of the convention will be great and lasting.

The first public meeting, on the afternoon of April 8, is to be presided over by the President of the United States, and on the evening of the same day the second public meeting is to be held under the chairmanship of Hon. John W. Noble, Secretary of the Interior. Two public meetings are called for the afternoon and evening of April 9, presided over respectively by Hon. Frederick Fraley, LL.D., president of the National Board of Trade, and Prof. S. P. Langley, LL.D., Secretary of the Smithsonian Institution. The final public meeting is to be held on the evening of April 10, to be presided over by Prof. Alexander Graham Bell.

The list of speakers and the subjects of their orations indicate the work of these public meetings, and give its character. Dr. John S. Billings, a scientist of international reputation, is to treat of "Invention and Discovery in the Field of Medicine, Surgery, and Sanitation." Judge Samuel Blatchford, of the United States Supreme Court, perhaps the leading judicial exponent of patent law, is to speak on the subject of "A Century of Patent Law." The Hon. Benjamin Butterworth, formerly Commissioner of Patents, now of the United States House of Representatives, is to treat the material development of the country as affected by invention. The "New South," as an outgrowth of invention and of the American patent law, is to be the subject of an address by Senator John W. Daniel, of Virginia. The Commissioner of Patents, Hon. Charles Eliot Mitchell, is to speak on the "Birth and Growth of the American Patent System," and the copyright system in similar aspects is to be treated by Hon. A. R. Spofford, Librarian United States Congress. Among the other distinguished speakers may be mentioned Professor Robert H. Thurston, Director of the Sibley College of Cornell University. He has chosen for subject "The Inventors of the Steam Engine." Much of his own work has been devoted to the theory of the heat engine in all its forms, and his theme seems peculiarly suited to his record.

The above is a very incomplete outline of the work before the convention, for besides the five public meetings and the numerous addresses, of which but a small part have been alluded to, there will be many other attractions. A special reception to inventors and manufacturers, and to ladies who accompany them, is to be held at the Patent Office on April 8, from 9 to 11:30 P. M. The guests are to be received by Secretary Noble and Commissioner Mitchell. Anniversary Day is the name given to April 10. On this date, over a century ago, General Washington, as President of the United States, signed the first American Patent Law, entitled "An Act to Promote the Progress of the Useful Arts." In commemoration of this act, at 10 A. M., on April 10, an excursion to Washington's old home and burial place, Mount Vernon, will take place. Here J. M. Toner, M.D., will deliver an address on the first president as an inventor and promoter of improvements.

In connection with the celebration, the director of the National Museum has consented to furnish space for a loan exhibition of relics, old models, and ancient