

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

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 the U. S., Canada or Mexico. \$5.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents.

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.

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, to one address, \$5.00 a year. To foreign Postal Union countries, \$6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$9.00 a year. To foreign Postal Union countries, \$11.00 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.

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 18, 1893.

Contents.

(Illustrated articles are marked with an asterisk.)

Books and publications, new... 171
Boston Harbor improvements*... 161
Bridge on Transandine Railway*... 164
Car coupler law, a new*... 162
Carts, mule, prices for... 167
Cold, resistance to... 170
Copper on birds' feathers... 169
Dynamo brushes, sparking of... 166
Electrical inventions, recent... 171
Exposition buildings, magnificent and silver sweepings, re- sisting*... 168
Gold and silver sweepings, re- sisting*... 168
Haswell, Charles H... 170
Invention of small things... 171
Inventions, recently patented... 171
Lantern slides, varnish for... 166
Locomotive, miniature, a beau- tiful... 167
Locomotive stone breaker, Aus- tin's*... 165
Locomotive valve, Kinney's*... 165
Mechanical devices, some new... 171
Nile, sources of the... 166
Notes and queries... 172
Patents granted, weekly recap- sults... 163
Patents, legal decisions on... 167
Phosphate washer, Beaty's*... 164
Photography, nickel-in-slit*... 170
Rises, new magazine... 168
Ships, old, breaking up... 170
Snow plows needed in Roumania... 166
Spider, the trap door... 166
Suicide, singular cause of... 169
Telephone, the, and Berliner patent... 162
Telephone wires, English de- scribe about... 170
Vessel, sunken, raising*... 166
Window awning, Brauner's*... 164
World's Fair notes... 163
Wrench, Kaltenbeck's*... 165

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 898.

For the Week Ending March 18, 1893.

Price 10 cents. For sale by all newsdealers.

I. AGRICULTURE.—Cockle Seed.—The ill effects of cockleseed in cattle feed, and what animals are badly affected by it... 14352
II. DECORATIVE ART.—The Theory of Storiation in Art.—By HUGH STANNUS.—A system of making decorative art tell a story.—The production of "histories and sermons which we can read without the trouble of turning over the leaves."... 14347
III. ELECTRICAL ENGINEERING.—The Edison Multipolar Dynamos.—Different forms of multipolar dynamo and the direct coupled dynamos now running in this city.—1 illustration... 14343
IV. ELECTRICITY.—Interesting Electrical Experiments.—A most interesting lecture by Lord Armstrong on dust figures and other electric phenomena.—By LORD ARMSTRONG... 14344
V. INVENTION.—An Age of Invention.—By DUANE DOTY.—An elaborate analysis of the official report of the Commissioner of Patents made before the United States Senate, February 1, 1892.—A most interesting presentation of the work done by inventors in this country... 14356
VI. MEDICINE AND HYGIENE.—The Correct Pronunciation of Medical Terms.—By WILLIAM DULANEY THOMAS.—Incorrect pronunciation common among medical men, with examples of correct pronunciation... 14352
The New Hospital for Children in Leipzig.—A graphic description, with numerous illustrations, of a German hospital for children.—9 illustrations... 14350
VII. MISCELLANEOUS.—The Tour of Switzerland.—A second installment of this interesting description of the beauties of Switzerland, touching on the Rigi, the Pilatus, the Matterhorn.—8 illustrations... 14354
VIII. NAVAL ENGINEERING.—The Chilean Armored Captain Prat.—A new French ship, recently built for the Chilean government.—1 illustration... 14347
The Use of Oil at Sea.—A practical and graphic article on this most interesting subject, showing exactly how oil is applied and different cases of its use.—5 illustrations... 14346
IX. TECHNOLOGY.—Animal Charcoal as a Decolorizer.—By T. R. CARSWELL.—An elaborate examination of the decolorizing action of animal charcoal... 14345
The Manufacture of Liquors and Preserves.—By J. DE BREVANS.—A further installment of this series of articles.—The determination of alcohol with Gay-Lussac's tables... 14352

THE NEW LAW FOR BRAKES AND CAR COUPLERS.

At the recent session of Congress, a law was passed making compulsory the use of brakes controlled by the engineer, and also the use of self-acting couplers. It will be noticed that no special inventions are selected, but the field is left open for the introduction at any time of the latest and best improvements.

In respect to car couplers it may be well for inventors to bear in mind that, while the link and pin variety of couplers has many advocates, especially among the brakemen, who have to handle the cars, still the Master Car Builders' Association advise the throwing out of the link and pins and the substitution of the knuckle form of couplers. The recommendations of the association have made much progress among railway companies, and the knuckle couplers are now extensively used on passenger cars.

The following is the text of the new law.

AN ACT

To promote the safety of employes and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their cars with automatic couplers and continuous brakes and their locomotives with driving wheel brakes, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled :

Sec. 1. That from and after the first day of January, 1898, it shall be unlawful for any common carrier engaged in interstate commerce by railroad to use on its line any locomotive engine in moving interstate traffic not equipped with a power driving wheel brake and appliances for operating the train brake system, or to run any train in such traffic after said date that has not a sufficient number of cars in it so equipped with power or train brakes that the engineer on the locomotive drawing such train can control its speed without requiring brakemen to use the common hand brake for that purpose.

Sec. 2. That on and after the first day of January, 1898, it shall be unlawful for any such common carrier to haul or permit to be hauled or used on its line any car used in moving interstate traffic not equipped with couplers coupling automatically by impact, and which can be uncoupled without the necessity of men going between the ends of the cars.

Sec. 3. That when any person, firm, company, or corporation engaged in interstate commerce by railroad shall have equipped a sufficient number of its cars so as to comply with the provisions of section one of this act, it may lawfully refuse to receive from connecting lines of road or shippers any cars not equipped sufficiently, in accordance with the first section of this act, with such power or train brakes as will work and readily interchange with the brakes in use on its own cars, as required by this act.

Sec. 4. That from and after the first day of July, 1895, until otherwise ordered by the Interstate Commerce Commission, it shall be unlawful for any railroad company to use any car in interstate commerce that is not provided with secure grab irons or hand holds in the ends and sides of each car for greater security to men in coupling and uncoupling cars.

Sec. 5. That within ninety days from the passage of this act the American Railway Association is authorized hereby to designate to the Interstate Commerce Commission the standard height of drawbars for freight cars, measured perpendicular from the level of the tops of the rails to the centers of the drawbars, for each of the several gauges of railroads in use in the United States, and shall fix a maximum variation from such standard height to be allowed between the drawbars of empty and loaded cars. Upon their determination being certified to the Interstate Commerce Commission, said commission shall at once give notice of the standard fixed upon to all common carriers, owners, or lessees engaged in interstate commerce in the United States by such means as the commission may deem proper. But should said association fail to determine a standard as above provided, it shall be the duty of the Interstate Commerce Commission to do so, before July 1, 1894, and immediately to give notice thereof as aforesaid. And after July 1, 1895, no cars, either loaded or unloaded, shall be used in interstate traffic which do not comply with the standard above provided for.

Sec. 6. That any such common carrier using any locomotive engine, running any train or hauling or permitting to be hauled or used on its line any car in violation of any of the provisions of this act, shall be liable to a penalty of one hundred dollars for each and every such violation, to be recovered in a suit or suits to be brought by the United States district attorney in the district court of the United States having jurisdiction in the locality where such violation shall have been committed, and it shall be the duty of such district attorney to bring such suits upon duly verified information being lodged with him of such violation having occurred. And it shall also be the duty of the Interstate Commerce Commission to lodge with the

proper district attorneys information of any such violations as may come to its knowledge: provided, that nothing in this act contained shall apply to trains composed of four-wheel cars or to locomotives used in hauling such trains.

Sec. 7. That the Interstate Commerce Commission may from time to time upon full hearing and for good cause extend the period within which any common carrier shall comply with the provisions of this act.

Sec. 8. That any employe of any such common carrier who may be injured by any locomotive, car or train contrary to the provision of this act shall not be deemed thereby to have assumed the risk thereby occasioned, although continuing in the employment of such carrier after the unlawful use of such locomotive, car or train had been brought to his knowledge.

THE TELEPHONE AND THE BERLINER PATENT.

As the federal administration changes, an interesting legacy to the incoming department of justice is the action commenced by the United States Attorney-General to annul what has become the famous Berliner patent for telephone transmitters. This is the patent issued on November 17, 1891, in pursuance of an application filed on June 4, 1877. A period of fourteen years was consumed in dilatory proceedings. The application was kept pending all this period, while the original Bell telephone patents were protecting the art of telephoning for the benefit of the assignees of the Berliner patent. The fifth claim of the first Bell telephone patent covered the method of transmitting sound by causing electrical undulations similar in form to the vibrations of air accompanying the sound. To this claim the courts awarded the broadest possible scope. The patent now has lapsed. On March 7, 1893, the undulatory current, as it has been called, became public property.

The apparatus for producing the undulatory current is the next question. By the expiration of the original Bell patent, just alluded to, the public acquires the right in general terms to an electro-magnetic telephone. On January 30, 1894, the second of the fundamental Bell patents will expire and the permanent magnet telephone will be public property. It would seem that the field of telephony should now be open.

In its early days the telephone was recognized as a very imperfect appliance for the transmission of speech. The Bell telephone, whether magnetic or electro-magnetic, acted very imperfectly as a transmitter. It required the use of a loud voice to cause sufficient vibration in the diaphragm to induce operative current changes.

The microphone came next. What the microscope does for the eyes, the microphone in some sense does for the ears. It produces changes of resistance in an electric circuit by varying the closeness of contact between two loosely-touching portions of the circuit. It may be of the simplest description. A couple of round nails may be attached to the ends of a broken circuit, and the interval may be closed by a third nail laid across them. If the nails are subjected to disturbance or agitation of any kind, the resistance at the points of contact will change. Even so simple a contrivance as this constitutes a microphone. It gives no sound. But if in the circuit with it is included a Bell telephone, the latter, by producing sound, responds to every disturbance however slight of the microphone. As a matter of practice, carbon is universally used as one or all of the electrodes or contact surfaces of the microphone. The action of a microphone usually depends on the changes of pressure between the faces of its abutting electrodes. All telephone transmitters are microphones.

The delayed Berliner patent, which will not expire until November 17, 1908, virtually claims any microphone depending for its action on changes of pressure between abutting electrodes. The same thing as far as apparatus is concerned was shown in the Reiss telephones of many years ago. The Bell telephone was shown in the House patent, also antedating the Berliner patent by many years. And now the public are to be enjoined from possession of the art of telephony until the next century shall have nearly completed its first decade.

The protection of the last seventeen years has had its effect in building up a powerful corporation. This corporation has introduced most extensive telephone plants in the cities of the United States, and recently has extended its long distance service by the erection of expensive metallic circuits between cities as distant as New York or Boston and Chicago. As its statutory monopoly seemed expiring, the company held a business standing almost as good as a monopoly. But not content with this, the issuing of the Berliner patent has been brought about, which continues their statutory protection for fifteen years more.

In the bill of complaint presented by the Attorney-General very serious allegations are made concerning the proceedings incident to the issuance of this patent. The specification was amended some three years after the date of application by the wholesale process of striking out the entire specification and claims, except the preamble and signature, by striking out all