Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order Address
MUNN & CO., 37 Park Row, New York.

☞ To Advertisers.—The regular circulation of the SCIENTIFIC AMERICAN is now **Fifty Thousand Copies** weekly For 1880 the publishers anticipate a still larger circulation.

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, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 37 Park Row, N Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, APRIL 17, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

American industries*..... 244
Atropine, artificial..... 242
Check-row*..... 243
Chinese, national plant of the... 240
Coffee, effect of, again 242
Collegians, illiterate 243
Corn planter*..... 243
Deaf, aids for the..... 240
Diamond making..... 248
Edison's horseshoe lamps..... 241
Electric lamp, Andre-Brougham* 245
Fish cultural Assn., American. 241
Fishes on the Pacific coast..... 248
Fertilizer, Graetzel's*..... 243
Gaseous mixtures, comp. of..... 249
Glucose, grape sugar, corn sirup. 249
Glucose manufacture..... 241
Hittites, the..... 247
Horse collar, steel, improved*.. 243
Ice-making apparatus*..... 246
Industries, American*..... 244
Inventions, agricultural 246
Inventions, engineering..... 246
Inventions, mechanical..... 248
Inventions, miscellaneous..... 243
Island, floating 242
La Plata Mining, etc., Co..... 249
Manufacture, Eng view of Am. 249
Moss industry in Louisiana 245
Museum of Art, Metropolitan... 240
Napier, John D..... 243
New York Exhibition of 1883.... 241
Notes and queries..... 250
Patent decisions..... 248
Petroleum in Russia 242
Photo-engraving..... 241
Phylloxera pest, the..... 247
Pipe tongs, improved*..... 246
Presses, hand and power*..... 242
Railways of London 249
Sciatica, nerve stretching in 242
Sea worms, edible, the..... 247
Sight for firearms, novel*..... 245
Signaling instruction..... 244
Sodawater, home-made 242
Speed regulator, novel*..... 245
Steel, hardened, straightening.. 246
Sugar in sorghum 245
Total solar eclipses..... 248
Trout, when it may be caught.... 248
Type, Farmer, Little & Co*..... 239
Type, manufacture of*..... 239
Vessels, buoying, new method*. 243
Wasp's strategy, a..... 248
Water cresses..... 248
Water system of New York..... 245
Whale, finback, capture of*..... 247
White perch, voice of the..... 249

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 224,
For the Week ending April 17, 1880.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Light Draught Stern Wheel Steam Yacht. 1 illustration. The Mary, U. S. Survey of the Upper Mississippi..... 3559
Small Steam Launch. 1 illustration..... 3559
The Severn Bridge 3559
The Boston Pacific.—The completion of the Atchison, Topeka, and Santa Fe Railway..... 3560
The Guns of the Future 3560
The Fracture of Cast iron..... 3560
Apparatus for Hot Pressing Woven Fabrics. 2 figures..... 3560

II. TECHNOLOGY AND CHEMISTRY.—Malleable Nickel and Cobalt..... 3564
Photography Applied to the Ornamentation of Glasses and Mirrors..... 3564
Leclerc's Process for Silvering Glass..... 3566
The Keeping of Gelatine Emulsion..... 3565
Pearl Inlaying on Iron..... 3565
Still Another Letter-Copying Process..... 3565
Lace Manufacture at Calais..... 3566
On the Artificial Formation of the Diamond By J. B. HANNAY.—Preliminary paper read before the Royal Society, Feb. 26.. 3573
New Process for Electrotyping Non-conducting Materials..... 3574
Analogy Between Fluidity and Galvanic Conductivity 3574
Action of Watery Vapor on Carbon at Different Temperatures. By C. G. DAHLERUS..... 3574

III. ARCHITECTURE, ART, ETC.—The Porosity of Building Materials. An important study of the condition and effects of natural ventilation.—The permeability of different building materials.—Natural stones.—Artificial stones.—Cements —Woods. 1 figure ... 3561
Mosaic Pavement in Cork Cathedral. 7 figures. Pavement of chancel, Cork Cathedral 3562
Small Conservatories. 1 illustration. A design for a lean-to conservatory. By Mr. NORMAN SHAW, R.A..... 3564
Improved Soil Pipe Ventilator. 3 figures. Boyle's "Air Pump" Ventilator..... 3564
The Statue of Galvani at Bologna. 1 illustration. From a photograph 3566

IV METALLURGY.—Why Does Steel Harden? Continuation of Mr. Metcalf's important investigations (SUPPLEMENT No. 223). Effects of repeated hardening.—Theoretical causes of hardening.—Principles established.—Discussion 3566

V ELECTRICITY, ETC.—Dynamo-Electric Machines. (Continued from No. 222.) The Siemens Machines.—Systems of Herr Frolich, Von Alteneck, Siemens, and Brequet. 13 figures..... 3567
The Electric Light. The Andre lamp..... 3568
Wackermann's Hydrostatic Balance. 1 figure..... 3568
New Luminous Tubes 3568

VI. ASTRONOMY, ETC.—Edmund Halley. His life and work..... 3570
Solar Eclipse of January 11, 1880. Preliminary report of Mr. George Davidson, U S Coast and Geodetic Survey..... 3572

VII. PHYSICS.—A Simple Mercurial Air Pump. By GEO. M. HOPKINS An ingenious method of making an efficient Sprengel-Geissler pump without glass blowing. 10 figures..... 3568
The Theater Praxinoscope. 1 illustration 3570

VIII. MEDICINE AND HYGIENE.—Constipation Viewed as a Disease *per se*, and an exciting cause of disease. By ROBT. BELL, M.D. 3572
Albuminate of Iron.—Its Preparation and Use. By Dr. W DONITZ 3574
The Hereditary Effect of Extirpation of the Spleen 3574
Burns and Scalds 3574

IX BIOLOGY, ETC.—Height and Span of the Japanese. An interesting investigation of Japanese physique..... 3565
The Odor of the Soul.—Dunstmaier's tests of Jager's theory.—The latest phase of "philosophic" craze..... 3576
The Decay of the Emotions..... 3576
The Treatment of Horse's Legs..... 3574
A New Class of Roses..... 3574

THE NATIONAL PLANT OF THE CHINESE.

The uses of the bamboo, says Dr. S. W. Williams (author of "The Middle Kingdom"), are so numerous as to entitle this grass to be called the national plant. It grows naturally throughout the country nearly to the latitude of Pekin, diminishing in size and strength as one goes northward. The varieties induced during the long period of its culture are numerous, and a native writer on its propagation observes at the outset of his treatise that he could not undertake so much as to name them all, and would therefore confine himself to a consideration of sixty three of the principal. Some of them are like trees, forty or fifty feet high, with culms eight inches in diameter at the root; others resemble pipe-stems through their length, graceful and slender as a magician's wand; while one kind presents a black, and another has a bright yellow skin. This plant may well be called useful, for it is applied by the Chinese to such a vast variety of purposes that they are puzzled to get along without it when they emigrate where it does not grow. The tender but tasteless shoots are cut for food, either boiled, pickled, or comfited, as the customer wishes. The seeds, too, furnish a farina suitable for cakes, and the Chinese have a proverb that the bamboo flowers chiefly in years of famine. The gnarled roots are carved into fantastic images of men, birds, monkeys, or monstrous perversions of animated nature; cut into lantern handles or canes, known in commerce as "whangees;" or turned by the lathe into oval sticks for worshipers to divine whether the gods will hear or refuse their petitions.

The tapering culms are used for all purposes to which poles can be applied in carrying, supporting, propelling, and measuring, by the porter, the boatman, and the carpenter in all cases where lightness, strength, and length are requisites. The joists of houses and the ribs of sails, the shafts of spears and the wattles of hurdles, the tubes of aqueducts and the rafters of roofs, the handles of umbrellas and the ribs of fans are all constructed of bamboo. The leaves are sewed upon cords in layers to make rain cloaks, swept into heaps for manure, matted into thatches, and used as wrappers in cooking rice dumplings. Cut into slivers of various sizes, the wood is worked into baskets and trays of every form and fancy, twisted into cables, plaited into awnings over boats, houses, and streets, and woven into mats for the scenery of the theater, the roofs of houses, and the casings of goods. The shavings even are picked into oakum and mixed with those of the rattan, to be stuffed into mattresses. The bamboo furnishes material for the bed and the couch, chop-sticks to use in eating, pipes for smoking, flutes, curtains to hang in the doorway, brooms, screens, stools, coops, stands, sofas, and other articles too numerous to mention, of household necessity and luxury. The mattress to lie on, the chair to sit upon, the table to dine from, the food to eat, and the fuel to cook it with are alike derived from it. The ferule to govern the pupil and the book he studies both originate here. The tapering tubes of the native organ and the dreaded instrument of the lictor, the skewer to pin the hair with, and the hat to screen the head, the paper to write on, the pencil to write with, and the cup to hold the pencils; the rule to measure lengths, the cup to gauge quantities, and the bucket to draw water; the bellows to blow the fire with and the tube to hold the match; the bird cage and the crab net, the life-preserver and the children's buoy, the fishpole and sumpitan, the water-wheel and eaves-trough, sedan, wheelbarrow, and handcart, with scores of machines and utensils, are one and all furnished or completed by this magnificent grass, the graceful beauty of which when growing is comparable to its varied usefulness when cut down.

China could hardly be governed without the constant application of the bamboo, nor could the people carry on their daily pursuits without it. It serves to embellish the garden of the patrician and shade the hamlet of the peasant; it composes the hedge which separates their grounds, assists in constructing tools to work their lands, and feeds the cattle which labor on them. The boatman and weaver find its slender poles indispensable to their trades, while there is nothing the artists paint so well on wares and embroideries. The tabasheer found in the internodes has its uses in native pharmacy, and the silicious cuticle furnishes the engraver a good surface for carving and polishing.

THE METROPOLITAN MUSEUM OF ART.

The new building of the Metropolitan Museum of Art, in Central Park, New York city, was officially declared open to the public March 30. A large number of prominent citizens were present, including President Hayes and the Secretary of State. In accepting the building from the Park Department, the president of the museum spoke of the encouraging beginning that had been made in art collections, and said that the department devoted to industrial art promised to be soon filled. The industrial art schools had made a good beginning and were proving successful. The main address of the occasion was delivered by Joseph H. Choate, on the history and future plans of the museum. Mr. Choate said that the aim of the trustees was not to establish a mere cabinet of curiosities which should serve to kill time for the idle, but gradually to gather together a more or less complete collection of objects illustrative of the history of art in all its branches, from the earliest beginnings to the present time, which should serve not only for the instruction and entertainment of the people, but should also show to the students and artisans of every branch of industry in the high and acknowledged standards of form and of color, what the past had accomplished for them to imitate and excel. It was also a prominent feature of the plan, in which some progress has already been made, to establish a Museum of Industrial Art, as distinct from the beautiful in art, for the direct and practical instruction of artisans, showing the whole progress of development from the raw material, through every artistic process to the most highly wrought product of which art is capable.

The building now open forms one-twelfth of the plan of the grand structure proposed for the museum.

AIDS FOR THE DEAF.

Dr. C. H. Thomas, of Philadelphia, has been making a careful study of audiphones, dentiphones, and other devices for helping the deaf to hear. As stated in a lecture before the Philadelphia County Medical Society, since published in the *Medical Times*, the objects sought in his investigations were:

(1) To demonstrate the principles upon which their action is founded; (2) to determine the practical value and range of use of these instruments; (3) to devise other and more convenient and less conspicuous forms of mechanism which might be substituted for them; (4) to improve the quality and increase the volume of the sound conveyed; (5) to discover new physiological and pathological facts relating to the functions of vocalization and hearing; and (6) to throw open to professional, and so to public, use the results gained, thus supplying data for further investigation and invention.

It appeared that both the audiphone and dentiphone depend for their action upon the principle of acoustics that solids—in this case in the form of thin plates—vibrate in unison with the sound waves produced in the air near them. In these instruments the vibrations are of sufficient force to be audible when conveyed to the internal ear through the medium of the teeth and cranial bones, independently of the ordinary channel of hearing—the transmission being direct in the audiphone and indirect through the conducting string in the dentiphone. In the audiphone not tension but the arched form is the condition essential to its proper action, for this form is that best adapted to impart the impact of sound waves against its convexity, which is then expended as thrust of the arch against the teeth, these forming one of its abutments.

To do away with conspicuousness and inconvenience of these instruments, Dr. Thomas made one in which the large receiving diaphragm was attached to a curved rod of wood or metal, like a pipe-stem. In this way the diaphragm was supported below the level of the face by the curved stem held firmly between the teeth, allowing the user to have his hands free and his face uncovered. In experimenting with different materials for diaphragms it was found that when substances lacking in resonance were used (such as celluloid and binder's board) flatness of tone resulted. Substances, which were over-resonant or over persistent in their vibrations (as vulcanite and ferrotype metal) yielded ringing or confused sounds. The quality needed is that possessed by good sounding boards, of instantly responding to contiguous sounds and maintaining them during their continuance, and also of instantly ceasing to vibrate upon the cessation of the causative sound. This right sort of elasticity of resonance, that capable of reproducing human voice tones in their purity, is possessed to a high degree by fuller's board (or press-board), which, when treated with shellac varnish and thoroughly dried, has proved not only far better than other paper or cardboards, but is also a great improvement upon the sheet metals or hard rubber, lacking the "reverberations" and "roaring sounds" of the latter, as they are described by different patients upon whom they have been tested. Besides, owing to its greater elasticity, it is less destructible than either these or the thin sheets of wood which otherwise answered the purpose, while its cost is but trivial.

The simplest instrument, one that excels either the audiphone or the dentiphone in the volume of sound transmitted, consists simply of a small rod of hard wood—a convenient size being about two feet long and a quarter of an inch thick—one end of which is placed against the teeth of the speaker, the other resting against or between the teeth of the person hard of hearing. If the speaker now articulates in a natural tone of voice, the vocal vibrations will be transmitted in great volume through the teeth and thence to the ears of the deaf person.

Later observations show that it will also convey the voice distinctly when placed against the forehead or other portions of the skull of the hearer. It will also convey perfectly audible speech from the skull of one to that of the other, or in its absence such sounds may be conveyed by simply bringing the heads themselves in contact. Again, instead of the speaker holding it against his teeth, he may place it against the upper part of his chest, when, upon using his voice, the sound will be conveyed as before, of course independently of the teeth of either person.

That these instruments are of great value in a considerable proportion of cases of deafness, Dr. Thomas thinks there is no reason to doubt, but there is, in his opinion, no just ground for the public belief that with their aid the deaf are enabled to hear as well as those with ordinary hearing. On the contrary, they supply but a very small fraction of normal hearing—much *less* than a *hundredth part*. The difference between normal hearing and that derived through these means is hardly less marked than that between sunlight and candle-light; nevertheless, this very small fraction is a priceless value in many cases, for to those who practically hear nothing without them, who sit in acoustic darkness, the gain