

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

G. 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., 261 Broadway, corner of Warren 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, 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., 261 Broadway, corner of Warren street, New York.

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, \$50.00 a year, sent prepaid to any part of the world. Single copies 50 cents. (3.) 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., 261 Broadway, corner of Warren street, New York.

NEW YORK, SATURDAY, JANUARY 5, 1884.

Contents.

(Illustrated articles are marked with an asterisk.)

Business and personal.....	10	Inventions, miscellaneous.....	10
Butter, adulterations in.....	3	Iron, effect of furnace gases on.....	7
Canada Atlantic Rwy, fast trains.....	7	Jewels, luminous.....	4
Carbonic acid, liquefied.....	9	Linseed, white.....	3
Casts larger or smaller, to make.....	6	London inter. exhib. 1884.....	3
Cheese, improved cookery of.....	3	Macfarlane, Robert.....	2
Compass, a new.....	7	Magnetic pole, movement of the.....	7
Compositions, children to write.....	4	Man and horse, race between.....	3
Converting iron art. into steel.....	2	Motive power, compressed air.....	9
Cooking steamer.....	5	Motive power, cost of.....	6
Developer for gelatine plates.....	7	New books and publications.....	11
Diamond drill, heavy work with.....	2	Notes and queries.....	11
Eighty ton gun.....	6	Organ industry, the.....	3
Electric railway, new.....	3	Propulsion of vessels, pneumatic.....	3
Electric system, the thirty.....	1	Prosperity and disaster.....	8
Lighthouse, new, Hudson River.....	1	Railway riveting machine.....	4
Experiment, an interesting.....	6	Regulator and cond. steam pump.....	5
Field drag.....	4	Saw clamp fastener.....	4
Forest preservation.....	7	Shovel plow.....	4
Game table.....	6	Softening iron castings, process.....	4
Gas burner, the first.....	5	Spiders, stuffed.....	7
Gas lighter, electric.....	9	Stereoscopic pic., single camera.....	7
Gelatine plates, imp. in developrs.....	1	Stump lands, how to clear.....	6
Gilt frames, removing spots from.....	9	Sulphur, elec. conduc. of.....	2
Head and hand, school for.....	3	Telegraph, invention of the.....	8
Hot blast, monument to inventor.....	8	Telescopes, progress in size of.....	7
Humming birds, taming wild.....	9	Transmission of power by shafts.....	6
Index of inventions.....	11	Water pipes, cleaning.....	4
Invention, grammared out of.....	2	Waterproofing, two systems of.....	7
Inventions, agricultural.....	10	West, great settlement of.....	2
Inventions, engineering.....	10	Wind power, storing.....	7
Inventions, mechanical.....	10		

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 418,

For the Week ending January 5, 1884.

Price 10 cents. For sale by all newsdealers.

	PAGE
I. CHEMISTRY, METALLURGY, ETC.—A New Residual Product from the Distillation of Coal.—By GEO. E. DAVIS.....	6674
The Estimation of Sulphur in Coal Gas.....	6674
Determination of the Equivalents of Metals by Means of their Sulphates.—By H. DAUBIGNY.....	6674
II. ENGINEERING.—The Panama Canal.—With full page of engravings.....	6663
The Bismarck Bridge over the Missouri River.—Northern Pacific Railway.—Treating of the difficulties to be overcome, methods of construction, etc.—With engravings of the bridge and details of the same.....	6664
III. TECHNOLOGY.—How to Make Concrete Walls.....	6667
Scamoni's Electrotyping Method of Reproducing Photo-Reliefs.—1 figure.....	6672
IV. ARCHITECTURE.—The New City Hall, Vienna, Austria.—With full page engraving.....	6672
V. ELECTRICITY AND MAGNETISM.—Imitation of the Phenomena of Electricity and Magnetism by Liquid or Gaseous Currents.—Experiments, and effects obtained, which effects are examined from the standpoints of mechanics, physics, chemistry, and physiology, and conclusions reached.—By C. DECHARME.—With numerous engravings illustrating the different experiments.....	6668
VI. NATURAL HISTORY.—The Ice of Greenland and the Antarctic.....	6677
Our Animal Enemies and Allies Reconsidered.....	6678
VII. HORTICULTURE, IRRIGATION, ETC.—The Great Vinery at Chiswick.—With engraving.....	6676
Obscured Glass for Vineries.....	6676
Irrigation in California.—Six companies furnishing water from King's River to reclaim parched lands in the San Joaquin Valley.—Estimated capacity to water 650 square miles.—From letter of JOHN L. DOW.....	6676
VIII. MEDICINE, HYGIENE, ETC.—Sewer Gas and its Dangers.—The germ theory.—Injurious effects when specific germs were absent.—By DR. G. W. MCCASKEY.....	6674
Entomology and Medical Science.....	6675
IX. MISCELLANEOUS.—The German Corvette Prince Adalbert.—With engraving.....	6667
Demerara Greenheart.—A valuable wood for shipbuilders.—Wood as fireproof building material.....	6675

CONVERTING IRON ARTICLES INTO STEEL.

Some experiments, which may prove to be a valuable improvement, have recently been made in the manufacture of articles of iron to be afterward cemented or case hardened. The ordinary case hardening as usually applied is too well known to require more than a mention, but the experiments to which allusion is made refer to the production of articles of iron which are usually made direct from steel, especially springs—coiled, spiral, and flat. It is well known that in winding a coiled spring to any desired diameter allowance must be made for the back lash or reflexion of the wire, and the core upon which it is wound must be considerably smaller in diameter than would be the case if the wire when wound and released retained its position in its coils. In these experiments the workman used tough Swedish iron wire, or that made of similar iron adapted for conversion into steel. The iron is as soft as lead, so far as regards the absence of elasticity, and will "stay put" in any coil or crook. It will even coil around a flat bar, making a flat coiled spring, an impossibility with hard drawn brass or tempered steel wire. Every mechanic knows that a flat coiled wire spring would be a pleasant possibility on many a job where now a round coiled spring is the only possibility. But a hard wire wound on a flat bar would, when released, present a Jacob's ladder cross section unfit for any mechanical use.

When the spring is formed it is cemented, or case hardened by being packed in a box or crucible with bone charcoal or ferrocyanide of potassium (prussiate of potash) and subjected to the usual case hardening heat. It is hardened in a bath of animal oil, and drawn to the spring temper by the usual blazing process. Except the wire is of very small diameter only the outside is converted into steel, the core of the wire still retaining its tough iron property. A spring of No. 8 wire, American gauge, when cut, showed merely a skin of case hardening, or steel conversion, but the spring appeared to be as active as one made from the same gauge of steel wire, thus sustaining the views of many mechanics that it is only the exterior of a spring that performs the functions due to elasticity.

If this process of wire spring making proves to be reliable generally, with only as small a proportion of failures as the present method, it will supersede the common way of winding hard drawn iron and brass or tempered steel wire, as the spring may be made from the soft iron wire to exact size and to any required shape, and coiled springs of tested tension and required diameters may be made and kept in stock to be furnished to users as required. If this is possible it will not only create a new industry, but will relieve machine shops from the annoyance of winding wire springs, a department of work that occasions the loss of valuable time and the waste of large amounts of wire. An attempt has been lately made to cut file blanks of soft iron to be afterward converted on their surfaces, and it is possible that this method of converting or case hardening finished articles may be still further extended to advantage, especially when hardness of surface and toughness of interior may be desirably combined.

HEAVY WORK WITH THE DIAMOND DRILL.

We have lately seen samples of cores cut by the diamond drill that are marvelously curious. Sections of rock and ore drawn up from hundreds of feet below the surface showing the stratification and its inclination, with all the varieties of its composition; the veins of ore and its boundaries and dip as well marked and better measured than if the miner was down in the depths of earth sending up his samples; and what is more valuable, the diamond drill sends up the samples partly polished—so smooth is its cut that you have but to wet the core to bring out all the variegated hues of rock and ore. It matters not as to size—one inch to two feet is within the grasp of the modern explorer. Truly we are passing into the diamond age.

DOES NOT WANT TO BE GRAMMARED OUT OF HIS INVENTION.

A correspondent who is a practical worker and an ingenious inventor, but not a man of letters, is at present going through the ordeal of a suit which he has brought against a rich railway corporation for infringement of one of his patents. He complains of the twists and strains in which the lawyers and judges seem to indulge over the wording of the patents, by which means they try to jew the patentee out of his rights, and among other things says: "I think whatever is new about a patent belongs to the one who has the patent, whether there is a special claim on it, or its parts, or not; and they can't grammar me out of it; for I think I have not got to put my name on every spear of grass in order to own a meadow, whether I mention the word lot or not in my deed or patent."

Our correspondent's idea is a good one. An inventor ought to be protected in the enjoyment of whatever is new and useful in his patented invention, and ought not to be deprived of the fruits of his labors because a sentence in his specification contains a word too much or too little. Our correspondent's idea is in accordance with the spirit of the Constitution, which provides for the issue of patents for the special purpose of encouraging the progress of the arts and sciences. Liberty, encouragement, and the broadest possible protection of the inventor should therefore be the aim of the courts and of the Patent Office. This the Constitution calls for. But some of the courts and some of the Patent Office officials occasionally seem to take exactly

the opposite view, and appear to labor under the notion that it is their duty to discourage, limit, reduce, and nullify as much as possible the constitutional rights of authors and inventors.

ROBERT MACFARLANE.

Robert Macfarlane was born in Rutherglen, near Glasgow, Scotland, April 23, 1815, and died of paralysis in Brooklyn, N. Y., December 21, 1883. His school education was limited to that which was furnished by the parish school of his native town; but he early formed good habits of study, which grew upon him through life.

In 1836, at the age of twenty-one, after having learned the trade of dyer in his father's dye works at Paisley, he sought a new home in the United States, and since that time he has resided in the State of New York. In 1840 he took up his residence in Albany, and soon made his mark among the intellectual and public spirited citizens. Here he was editor of the *Mechanic Mirror*, the organ of a New York State association in the interest of the artisan classes. His able management of this paper led to his appointment, in 1848, as editor of the SCIENTIFIC AMERICAN, and he occupied this position for seventeen years, with the eminent approval of his associates and the patrons of the paper.

In 1865 he was threatened with a failure of eyesight, and felt obliged to suspend writing and study and to seek other employment. He returned to Albany, and there set up a business as dyer and practical chemist; the business was quite successful from the beginning. In 1874 he retired from the active management of the dyeing establishment in favor of his two sons, who have since carried it on and maintained its high reputation. Since 1874 Mr. Macfarlane has resided most of the time in Brooklyn, and free from the cares of business.

He revisited Scotland twice, in 1839 and in 1875. The last visit was described in a series of sketches under the title of "Rambles in Scotland," published in the *Scottish-American Journal*. The sketches were widely read in the United States, and were reproduced in Scotland. Mr. Macfarlane was the author of a History of the Screw Propeller, and was editor of an elaborate Treatise on the Art of Dyeing, both of which were published by John Wiley, of New York. He also has a high repute in Scotland and America as a contributor to literature relating to Scottish antiquities and to the history of Scottish emigration to America. He often used the *nom de plume* Rutherglen.

Mr. Macfarlane was a man of exalted moral character, and his integrity was probably never suspected by any one who was acquainted with him.

Rapid Settlement of the Great West.

The *Financial Chronicle* has an important article on "Government Land Sales," showing the amount of public lands disposed of during the past six years in the several States and Territories, as indicating the direction in which population is moving. The total number of acres disposed of in the year 1883 was 16,830,455. The table of largest sales, in the order of magnitude, is as follows:

	Acres.
Dakota.....	6,889,595
Nebraska.....	1,315,104
Minnesota.....	1,292,969
Kansas.....	808,655
Washington Territory.....	763,779
California.....	704,274
Mississippi.....	516,511
Oregon.....	499,770
Louisiana.....	487,599
Arkansas.....	460,666
Wisconsin.....	454,002
Florida.....	431,749

Texas is not embraced in the list, as the United States have no public lands in that State. The list includes lands sold for cash, and taken under the Homestead and Timber Culture acts. The sales for six years have been as follows:

	Acres.
1878.....	6,856,781
1879.....	8,649,259
1880.....	9,090,495
1881.....	8,379,518
1882.....	12,526,262
1883.....	16,830,455

The increase of sales during the past two years has been very marked, being at the rate of 50 per cent in 1882 over 1881, and 40 per cent in 1883 over 1882. This extraordinary addition to the producing power of the nation, the *Chronicle* argues, must soon tell favorably on the existing business depression, for although the opening of new territory cannot be expected to show full results in the first or even the second year after settlement, "yet when it is remembered that during the two years since the depression set in, more than twenty-nine and a quarter millions of Government acres have been entered upon, it will readily be seen what a wonderful recuperative power this continued opening of new territory offers."

Electric Conductivity of Sulphur.

A professor at one of the French *lycees* has discovered that though sulphur is an insulating material at its ordinary temperature, it becomes a conductor as soon as it is heated. Its conducting power increases with the temperature, and at the fusing point is very considerable. At 320° Fahr., at which point sulphur changes its physical condition and becomes pasty, the conducting power diminishes, but increases again when the substance has attained perfect fluidity. Similar facts have been noticed with regard to phosphorus.