

Advertisements.

Inside Page, each insertion... Back Page, each insertion... The above are charges per agate line...

TO INVENTORS AND MANUFACTURERS

The Fifty-Fifth Annual Exhibition of the AMERICAN INSTITUTE OF THE CITY OF NEW YORK...

HUB FRICTION CLUTCH. The Ideal Friction Clutch will transmit any power...

Caligraph. LIFE-SHORT WRITE-WAY. Address: The American Writing Machine Co., Hartford, Conn.

SCIENTIFIC METHOD IN MECHANICAL ENGINEERING.—A lecture by Prof. Coleman Sellers...

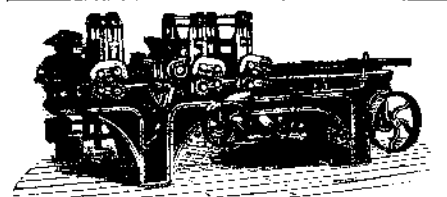
Telegraph and Electrical SUPPLIES. Medical Batteries, Inventors' Models...

MILL OWNERS. Price of Burnham's Improved Standard Turbine is cost of manufacturing.

INTERNATIONAL INSTITUTE FOR Liquefied Carbonic Gas. O. BRUNLER, 857 Broadway, New York.

MODERN BRONZE ALLOYS.—A Paper by P. F. Nursey, C.E., presenting some valuable data concerning such bronzes...

TESTS OF CEMENT.—REPORT OF THE committee on a uniform test for cement. Cement tests, Fineness, checking or cracking...



WINTERBY, RUGG & RICHARDSON, Manufacturers of Patent Copying Machinery of every description.

WM. A. HARRIS, Original and Only Builder of the HARRIS-CORLISS ENGINE.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements...

In this line of business they have had forty one years' experience, and now have unequalled facilities for the preparation of Patent Drawings...

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them...

We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents, 361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

Patent Riveted Monarch Rubber Belting. BEST IN THE WORLD. Specially adapted for PAPER MILLS, SAW MILLS, and THRESHING MACHINES. THE GUTTA PERCHA AND RUBBER MFG. CO., New York, Chicago, San Francisco, Toronto.

THE HAMMER TELEPHONE.—BY J. De Lucht Labye. Description of the apparatus, its operation, and the apparent contradiction by it of the Bell theory of continuous and undulating currents in telephonic transmission.

ELECTRIC LEATHER BELTING. Best and most reliable Belt ever introduced. Made by C. A. SUTHEREN & CO., 77 Ferry St., New York, 416 Arch St., Philadelphia; 86 Federal Street, Boston.

GOLD MEDAL, PARIS, 1878. BAKER'S Breakfast Cocoa. Warranted absolutely pure Cocoa, from which the excess of Oil has been removed. It has three times the strength of Cocoa mixed with Starch, Arrowroot or Sugar...

PROGRESS IN ASTRONOMICAL Telescopes.—By W. R. Warner. How the first telescopes were constructed. Galileo's telescope, Herschel's modifications, The Cassagranian system, Methods of overcoming chromatic aberration...

TIGHT & SLACK BARREL MACHINERY. A SPECIALTY. JOHN GREENWOOD & CO., ROCHESTER, N. Y.

A FAIR OFFER. If you will put a JENKINS BROS. VALVE on the worst place you can find, where you cannot keep other Valves tight, and if it is not perfectly tight or does not hold Steam, Oils, Acids, or other fluids longer than any other Valve, you may return it, and your money will be refunded.

THE PHILOSOHY OF TWIST.—Why twist is put in yarns for broadcloths, and the effect that it has in different classes of goods. Illustrated with two engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 490. Price 10 cents.

COPPER TUBES. SHEET BRASS BRASS WIRE. Mention this paper.

Barnes' Foot-Power Machinery. Complete outfits for Actual Workshop Business. Head what a customer says: "Considering its capacity and the accuracy of your No. 4 Lathe, I do not see how it can be produced at such low cost."

THE RESOURCES OF ALASKA.—AN interesting Paper by Frederick Schwatka. Timber lands, Yellow cedar and its value, The salmon industry and salmon canneries, Whale fishery, Scenery of Southeastern Alaska, The fur industry, Mineral resources, Agriculture. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 496. Price 10 cents.

A New Drill Chuck. THE HARTFORD. No. 1 holds 0 to 1/2 in. Price, \$7.00. No. 2 holds 0 to 3/4 in. Price, \$8.00. It cannot be excelled. Address THE CUSHMAN CHUCK CO., Hartford, Conn.

H. W. JOHNS' PATENT ASBESTOS ROOFING. THIS ROOFING is the perfected form of portable Roofing, manufactured by us for the past twenty-seven years, and is now in use upon roofs of Factories, Foundries, Warehouses, Cotton Gins, Chemical Works, Railroad Bridges, Cars, Steamboat Decks, etc., in all parts of the world.

H. W. JOHNS MANUFACTURING COMPANY, SOLE MANUFACTURERS OF Asbestos Fire and Water Proof Building Felt, Steam Packings, Boiler Coverings, Liquid Paints, Fire Proof Paints, Colors in Oil, Varnishes, etc., 175 Randolph St., Chicago. 170 North 4th St., Philadelphia. Billiter House, London.

Columbia Bicycles and Tricycles. CATALOGUE SENT FREE. THE POPE MFG. CO., 597 Washington St., Boston. Branch Houses: 12 Warren St., New York; 115 Wabash Ave., Chicago.

LUBRICATING OILS.—A PAPER BY C. J. H. Woodbury, giving the results of the examination of a single lubricant under a wide range of investigation concerning its friction. Illustrated with 6 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 473. Price 10 cents.

CARY & MOEN. STEEL WIRE OF EVERY DESCRIPTION AND STEEL SPRINGS. NEW YORK CITY. 234 W. 29 ST.

THE BEST STEAM PUMP. Van Duzen's Patent Steam Pump. Incomparable in cheapness and efficiency. Needs no care or skill; cannot get out of order; has no moving parts. A Superior Five Imp. Instantaneous and powerful, ever ready. Available, wherever steam pressure can be had, for pumping any kind of liquid (hot, cold, sandy, impure, etc.). We make ten sizes, prices from \$7 to \$75. Capacities from 100 to 20,000 gallons per hour. State for what purpose wanted and send for Catalogue of "Pumps." Van Duzen & Tilt, Cincinnati, O.

PERFUMES.—A PAPER BY JACOB JESSON, describing various articles used in perfumery, and the mode of preparing essences therefrom, stating the amount and cost of material required, and giving over thirty formulas for handkerchief extracts, with the cost of each. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 472. Price 10 cents.

PATENT JACKET KETTLES, Plain or Porcelain Lined. Tested to 100 lb. pressure. Send for Lists. HAND, BURR & CO., 614 and 616 Market St., Philadelphia, Pa.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. CONN. STEAM CATAMARAN MAY BARRETT. Plans and specifications of the catamaran May Barret, a family cruising boat built for use on rivers and lakes. Construction of hulls, deck beams, main deck, upper works, engine and boiler, wheel. With 10 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 472. Price 10 cents.

PERMANENT BROMIDE PAPER for copying drawings and printing from photographic negatives by lamplight or daylight. Circulars free. Drawings copied, enlarged, or reduced. Send for estimates. THE EASTMAN DRY PLATE & FILM CO., 137 State Street, Rochester, N. Y.

WIRE APPARATUS FOR LABORATORY use.—A paper by G. M. Hopkins, giving directions for the manufacture, from brass or thinned wire, of various useful and convenient implements for laboratory use. With 26 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 493. Price 10 cents.

CLARK'S NOISELESS RUBBER WHEELS. No more Splintered Floors. Different Styles. Catalogue Free. GEO. P. CLARK, Windsor Locks, Ct.

MICRO-ORGANISMS OF POTABLE Waters.—A paper by Dr. T. Leone, showing that atmospheric oxygen is not an element necessary for the increase of microbia in potable waters, and that the carbonic acid is the sole agent that interferes with the life of these organisms in carbonic acid waters. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 524. Price 10 cents.

THE AMERICAN BELL TELEPHONE CO. 95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

PROSPECTUS OF THE Scientific American FOR 1886.

The Most Popular Scientific Paper in the World. Only \$3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for one year—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of three dollars by the publishers; six months, \$1.50; three months, \$1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.00 each; additional copies at same proportionate rate. The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to MUNN & CO., 361 Broadway, New York.

THE Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archeology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information pertaining to these and allied subjects is given, the whole profusely illustrated with engravings.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are represented and described in the SUPPLEMENT. Price for the SUPPLEMENT for the United States and Canada, \$5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for \$7.00. Address and remit by postal order, express money order, or draft to order of MUNN & Co., 361 Broadway, N. Y.

Publishers SCIENTIFIC AMERICAN. To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, \$4, gold, for SCIENTIFIC AMERICAN, one year; \$9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal or express money order, or draft to order of MUNN & CO., 361 Broadway, New York.

PRINTING INKS. THE "Scientific American" is printed with CHAS. TENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., a d 47 Rose St., opp. Duane St., N. Y.