

Advertisements.

Inside Page, each insertion --- 75 cents a line. Back Page each insertion --- \$1.00 a line.

To Business Men.

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published.

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

Advertisement for Rochester Optical Co. featuring a photograph of a person and text: 'Any one can take good Photographs. Outfits \$10. and upward.'

Advertisement for Wells Bros. & Co. featuring an image of a screw plate and text: 'Screw Plates. Adjustable Die. Send for CATALOGUE F. F. F.'

WELLS BROS. & CO., GREENFIELD, MASS. MANUFACTURERS OF Screw Cutting Machinery and Tools for Machinists, Carriage Makers, and Blacksmiths' Use.

CAPILLARY ATTRACTION.—AN INTERESTING paper by William Thomson, discussing the question whether the attraction between any particle of matter in one body and any particle of matter in another continues to vary inversely as the square of the distance.

Transmission of Power. Suspension Bridges. Tramways, and other applications of

WIRE ROPE

Trenton Iron Co. WORKS and OFFICE, TRENTON, N. J. New York Office—COOPER, HEWITT & CO., 17 Burling Slip. Philadelphia Office—22 and 24 North Fourth Street

Advertisement for Copper Tubes and Sheet Brass Brass Wire with an image of a tube and text: 'COPPER TUBES SHEET BRASS BRASS WIRE'

Advertisement for Asbestos Roofing with an image of a roll of roofing and text: 'PRICE REDUCED. ASBESTOS ROOFING'

FIRE AND WATER-PROOF BUILDING FELT, FIRE-PROOF PAINTS, STEAM PACKINGS, BOILER COVERINGS, ETC. Samples and descriptive Price List free by mail. H. W. JOHNS MFG CO., 87 MAIDEN LANE, N. Y.

Advertisement for Hartford Steam Boiler Inspection and Insurance Co. featuring a circular logo with a steam boiler and text: 'HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.'

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had forty-one years' experience, and now have increased facilities for the preparation of Patent Applications, Specifications, and the prosecution of a Patent in all the principal countries of the United States, Canada, and Foreign Countries.

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.

Advertisement for Jenkins Standard Packing featuring an image of a packing can and text: 'JENKINS STANDARD PACKING TRADE MARK'

The Original Unvulcanized Packing CALLED THE STANDARD As it is the Packing by which all others are compared. JENKINS BROS. 71 John Street, N. Y. 105 Milk Street, Boston. 18 So. Fourth St., Phila. 54 Dearborn St., Chicago.

SHAFTING, PULLEYS, HANGERS, AND GEARING.

Advertisement for Patent Jacket Kettles featuring an image of a kettle and text: '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.'

ESTABLISHED HALF A CENTURY.

MARVIN'S FIRE & BURGLAR SAFES

HAVE MANY PATENTED IMPROVEMENTS NOT FOUND IN OTHER MAKES THAT WILL WELL REPAY AN INVESTIGATION BY THOSE WHO DESIRE TO SECURE THE BEST SAFE MARVIN SAFE CO. NEW YORK, PHILADELPHIA, LONDON, ENGLAND.

SOLID EMERY WHEELS.—BY T. D. Paret.—Early forms of emery wheels and their defects. Vulcanite wheels. The tanite wheels. Testing of tanite wheels at Stroudsburg. Best working speeds for emery wheels. Bursting of emery wheels. Tests for emery wheels. Comparative merits of American and English emery wheels. With 2 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 538. Price 10 cents. To be had at this office and from all newsdealers.



RUBBER BELTING, PACKING, HOSE, AND ALL OTHER KINDS OF RUBBER GOODS, FOR MECHANICAL and MANUFACTURING PURPOSES. THE LARGEST and MOST EXTENSIVE MANUFACTURERS in AMERICA. THE GUTTA PERCHA and RUBBER MFG. CO. New York, Chicago, San Francisco, Toronto.

TO MANUFACTURERS, PATENTEES OR CONTRACTORS.

Estimates will be given and contracts made by the Household Sewing Machine Co., for the manufacture of machinists' tools of any description. Will manufacture, under contract patented specialties. We are also prepared to do Japanning and Plating in large or small orders. Correspondence solicited. Address

Household Sewing Machine Co., Providence, R. I.

Advertisement for Le Page's Liquid Glue featuring an image of a glue bottle and text: 'LE PAGE'S LIQUID GLUE THE ONLY GENUINE LIQUID GLUE. RUSSIA CEMENT CO., GLOUCESTER, MASS. Sample by mail 25c. stamps.'

THE ARC ELECTRIC LIGHT.—A recent address before the New York Electric Light Association by Leo Daft, giving a brief review of the history of electric lighting, showing what it has accomplished in the past, and what are its future possibilities.

Advertisement for The Curtis Return Steam Trap featuring an image of a steam trap and text: 'THE CURTIS RETURN STEAM TRAP. For returning steam condensed under pressure automatically into the boiler, whether taken from above or below the boiler, without loss or waste. Manufactured by THE CURTIS REGULATOR CO., BOSTON, MASS. Send for Circular No. 19.'

Advertisement for Rice Automatic Cut-off Engine featuring an image of a large engine and text: 'RICE AUTOMATIC CUT-OFF ENGINE. Self-Contained. Sensitive Governor. Balanced Valve. High Speeds. Stationary Oilers. Best Economy. Gold Medal Cincinnati Exposition, 1884. THE JOHN T. NOYE MFG. CO., BUFFALO, N. Y.'

USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. In SCIENTIFIC AMERICAN SUPPLEMENT, 59. Price 10 cents. To be had at this office and of all newsdealers.

Advertisement for Electric Leather Belting featuring an image of a belt and text: 'ELECTRIC LEATHER BELTING. BEST and most RELIABLE for swift running. Chas. A. Schieren & Co., 71 Ferry St., New York. 416 Arch St., Phila. 88 Federal St., Boston.'

ON STEAM BOILERS.—A LECTURE by J. M. Allen, delivered in the Sibley College course.—The steam boiler, its construction and management. Different types of boilers. Material, Methods of riveting, Fractures, Boiler explosions. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 533. Price 10 cents. To be had at this office and from all newsdealers.

Advertisement for Notice to Users of Steam Pumps featuring an image of a pump and text: 'NOTICE to Users of Steam Pumps. We have received following letter in regard to one of our No. 5 "L" (\$16) Steam Jet Pumps elevating 1 1/2 inch pipe of water more than 50 feet high: "L'ANSE, MICH., Feb. 24, 1883. "VAN DUZEN & TIFT, Cincinnati, O.: "Money could not buy the Jet of us unless another could be had. I would not give your No. 5 "L" for a \$700 pump, equal distance to raise. "N. A. Litchfield, Supt. Mich. Slate Co." We make Ten Sizes of these Pumps. Prices \$7 to \$75. Capacities 10 to 2500 gallons per hour. State for what purpose wanted and send for Catalogue of "Pumps." VAN DUZEN & TIFT, Cincinnati, O.'

Advertisement for Withery, Rugg & Richardson featuring an image of a large industrial machine and text: 'WITHERY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.'

Advertisement for Tight & Slack Barrel Machinery featuring an image of a barrel and text: 'TIGHT & SLACK BARREL MACHINERY IS A SPECIALTY JOHN GREENWOOD & CO. ROCHESTER N. Y.'

Advertisement for Olsen's Testing Machinery featuring an image of a testing machine and text: 'OLSEN'S Testing Machinery For Business and Scientific purposes. Illustrated catalogues furnished on application to TYNNIUS OLSEN & CO., 500 No. 12th St., Phila., Pa., U. S. A.'

RADI OF CURVATURE GEOMETRICALLY CONSIDERED. By Prof. C. MacCord, Sc.D.—Explanation of a new method of determining the radii of curvature of many plane curves by very simple graphic construction, the proposed mode of operation being based upon the fundamental ideas of regarding a line as generated by the motion of a point, the tangent as the direction of that motion at a given instant, and the normal also as a line in motion. With 12 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 537 and 538. Ten cents each. To be had at this office and from all newsdealers.

Advertisement for Model and Experimental Work featuring an image of a model and text: 'MODEL and EXPERIMENTAL WORK — A SPECIALTY. Send for Circulars. C. E. Jones & Bro., CINCINNATI, O. (Mention this Paper.) A New Catalogue of Valuable Papers contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent free of charge to any address. MUNN & CO., 361 Broadway, N. Y.'

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.

THE Scientific American Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors, and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

Architects, Builders, and Owners will find this work valuable in furnishing fresh and useful suggestions. All who contemplate building or improving homes or erecting structures of any kind, have before them in this work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers.

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

Building Plans and Specifications.

In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish Plans and Specifications for Buildings of every kind, including Public Buildings, Churches, Schools, Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address

MUNN & CO., 361 Broadway, New York.

Advertisement for Printing Inks featuring an image of an ink bottle and text: 'PRINTING INKS. THE "Scientific American" is printed with CHAS. T. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.'