

Advertisements.

Inside Page, each insertion - - - 75 cents a line. Back Page, each insertion - - - \$1.00 a line. (About eight words to a line.) Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

No. 4 Tool Handle.



This handle is six inches long, and incloses ten large working size tools, of best quality, viz.: Three Brad Awis, two Chisels, one each Gouge, Scratch Awl, Saw, Screw Driver, and Hammer. The Steel jaws will hold either of these tools; also Files, Awis, and Needles of all kinds. The handle is of Rosewood, with Lignumvita Cap, both highly polished. The jaws and sleeves are polished and nickel plated. They are as useful tools as were ever put on the market, and will never fail to please. Sent, by mail, on receipt of One Dollar. Hardware dealers will furnish them at the same price.

MILLERS FALLS CO., 74 Chambers St., New York City.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ba & Co., Worcester, Mass. Send for Catalogue.

H.W. JOHNS' ASBESTOS

Roofing, Building Felt, Steam Packings, Boiler Coverings, Fire Proof Paints, Cements, Etc. Samples and Descriptive Price Lists Free. H. W. JOHNS MFG CO., 87 MAIDEN LANE, N. Y. 175 Randolph St., Chicago, 170 N. 4th St., Philadelphia.

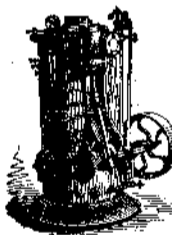


BUY ONE. Buy a good one. Buy the House Patent Scroll Saw. With it you can saw both wood and metal. A child can run it as easily as a sewing machine. You can decorate your walls with beautiful brackets. You can sell the work and make money. Send 6c. for 36-page illustrated catalogue of Saws, Tools, and Designs of Scroll Sawing. H. H. FINEBOY, Section 8, 216-220 Asylum St., Hartford, Conn.

WM. A. HARRIS, Providence, R. I. (Park St.). Six minutes' walk West from station. Original and Only Builder of the HARRIS-CORLISS ENGINE, With Harris' Pat. Improvements, from 10 to 1,000 H. P. Send for copy Engineer's and Steam User's Manual. By J. W. Hill, M.E. Price \$1.25. MENTION THIS PAPER.

Manufacturers of Woodware. - For Sale, State rights to manufacture and sell the most important article required in every dwelling, public building, etc., having American and European endorsement. Produced at small cost, yielding 250 per cent profit. Canadian rights for sale. J. HADGER, 42 West 134th St., New York.

SHAW & GEARY, Manufacturers of Electrical Appliances, Light Machinery, Special Tools, Models, etc. 55 N. 7th Street, Philadelphia, Pa.



BOOK WALTER ENGINE. Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of \$240 00. 4 1/2 " 280 00. 6 " 355 00. 8 " 440 00. Put on cars at Springfield, O. JAMES LEFFEL & CO., Springfield, Ohio, or 110 Liberty St., New York.

SHORTHAND Writing thoroughly taught. Situations procured by mail or personally. Send for circular. W. C. CHAFFEE, Oswego, N. Y.

WORKING MODELS And Experimental Machinery, Metal or Wood, made to order by J. F. WEINER, 82 Center Street, New York.



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 years' experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

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.

THE BRIDGEPORT WOOD FINISHING CO. G. M. BREINIG, AGENT, PRINCIPAL OFFICE AT MANUFACTORY NEW MILFORD, CONN. NEW YORK BUSINESS OFFICE, 95-98 MAIDEN LANE, MANUFACTURERS OF WHEELERS PATENT WOOD FILLER. BREINIG'S LITHOGEN SILICATE PAINT. LITHOGEN PRIMER, WOOD STAINS. SILEX FLINT AND FELDSPAR. PAMPHLET GIVING DIRECTIONS FOR FINISHING HARD WOOD FREE TO ANY ADDRESS.

COLUMBIA BICYCLES. THE POPE & CO. MFG. CO. & TRICYCLES. BOSTON, MASS. Illustrated Catalogue sent Free.

Branch Houses: 12 Warren Street, New York. 115 Wabash Avenue, Chicago, Ill.

BARREL, KEG, Hoghead, AND STAVE MACHINERY. Over 50 varieties manufactured by E. & B. Holmes, BUFFALO, N. Y.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS. THOMAS DEVLIN & CO. LEHIGH AVE. & AMERICAN ST. PHILA.

STEAM ENGINES. Horizontal and Vertical. Dredging Machinery, Flour, Roller, Slate and Fire Mill Machinery, Turbine Water Wheels. York Mfg Co., York, Pa., U. S. A.

NEW YORK BELTING AND PACKING CO.

Oldest and Largest Manufacturers in the United States of Vulcanized Rubber Fabrics. ADAPTED TO MECHANICAL PURPOSES. RUBBER BELTING, PACKING, AND HOSE, CORRUGATED Mats and Matting, and Stair Treads, &c. BICYCLE TIRES, CAR SPRINGS. JOHN H. CHEEVER, Treas. New York Belting and Packing Co., JOHN D. CHEEVER, Dep't Treas. Warehouse, 15 Park Row, opp. Astor House, N. Y. Branches: 308 Chestnut Street, Phila., 167 and 169 Lake Street, Chicago, and 53 and 54 Summer Street, Boston.

CORUNDUM and EMERY WHEELS, MANUFACTURED FROM CAREFULLY SELECTED STOCK BY THE Lehigh Valley Emery Wheel Co., LEHIGHTON, PENNA. Send for Price List.

THE BACKUS WATER MOTOR. SUPPLIES FROM HYDRANT PRESSURE the cheapest power known. Invaluable for blowing Church Organs, running Printing Presses, Sewing Machines in Households, Turning Lathes, Scroll Saws, Grindstones, Coffee Mills, Sausage Machines, Feed Cutters, Electric Lights, Elevators, etc. It needs little room, no firing, no fuel, ashes, repairs, engineer, explosion, or delay, no extra insurance, no coal bills. Is noiseless, neat, compact, steady; will work at any pressure of water above 15 lb., at 40 lb. pressure has 4-horse power, and capacity up to 10-horse power. Prices from \$15 to \$300. Send for circular to THE BACKUS WATER MOTOR CO., Newark, N. J.

AUSTRALIA. American Manufacturers wishing to be represented in these colonies please communicate with Messrs. Murray & Co., Australian Agents, 23a Basinghall St., London, E. C., and at Sydney and Melbourne.

KEUFFEL & ESSER, 127 Fulton St. and 42 Ann St., NEW YORK. Manufacturers and Importers of Drawing Papers and Materials, SURVEYING INSTRUMENTS OF HIGHEST QUALITY. Send for Catalogue and Samples of Paper.

PORTLAND CEMENT. S. L. MERCHANT & CO., 25 State St., New York. \$1.00 per barrel, \$2.00 per ton.

Goss & Phillips Mfg. Co., Chicago, SASH, DOORS, BLINDS, MOULDINGS. Hardwood Interior Finish a Specialty. CORNER FISK and WEST 22d STREET, CHICAGO.

JENKINS BROS.' VALVES. Gate, Globe, Angle, Check, and Safety. MANUFACTURED OF BEST STEAM METAL. The Jenkins Disks used in these Valves are manufactured under our 1880 Patent, and will stand 200 lb. steam-pressure. To avoid imposition, see that valves are stamped "Jenkins Bros." JENKINS BROS., 71 John Street, New York. Send for Price List "A." 79 Kilby Street, Boston

PIPE COVERING.



SPECIAL FELT FOR ICE HOUSES. Fireproof Non-conducting Coverings for Steam Pipes, Boilers, and all hot surfaces. Made in sections three feet long. To apply, Asbestos Materials-Fiber, Millboard Packing, and Cement. CHALMERS-SPENCE CO. 419-421 Eighth St., New York.

THE HARDEN STAR HAND GRENADE FIRE EXTINGUISHER

Puts Out Fire Instantly. See editorial notice in SCIENTIFIC AMERICAN of November 23, 1884. Send for circulars. Address Harden Hand Grenade Fire Extinguisher Co., 205 Wabash Ave., Chicago, 10 Oliver St., Boston, or 84 West Broadway, New York.

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.

THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

Published Weekly, \$5.20 a Year; \$1.60 Six Months.

This unrivaled periodical, now in its forty-first year, continues to maintain its high reputation for excellence, and enjoys the largest circulation ever attained by any scientific publication.

Every number contains sixteen large pages, beautifully printed, elegantly illustrated; it presents in popular style a descriptive record of the most novel, interesting, and important advances in Science, Arts, and Manufactures. It shows the progress of the World in respect to New Discoveries and Improvements, embracing Machinery, Mechanical Works, Engineering in all branches, Chemistry, Metallurgy, Electricity, Light, Heat, Architecture, Domestic Economy, Agriculture, Natural History, etc. It abounds with fresh and interesting subjects for discussion, thought, or experiment; furnishes hundreds of useful suggestions for business. It promotes Industry, Progress, Thrift, and Intelligence in every community where it circulates.

THE SCIENTIFIC AMERICAN should have a place in every Dwelling, Shop, Office, School, or Library. Workmen, Foremen, Engineers, Superintendents, Directors, Presidents, Officials, Merchants, Farmers, Teachers, Lawyers, Physicians, Clergymen, people in every walk and profession in life, will derive benefit from a regular reading of THE SCIENTIFIC AMERICAN.

Terms for the United States and Canada, \$3.20 a year; \$1.60 six months. Specimen copies free. Remit by Postal Order or Check.

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

THE Scientific American Supplement.

THE SCIENTIFIC AMERICAN SUPPLEMENT 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, Archaeology, 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 or check.

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 order or draft to order of MUNN & CO., 361 Broadway, New York.

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