

Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - \$1.00 a line
For some classes of Advertisements, Special and Higher rates are required.

The above are charges per square line—about eight words per line. This notice shows the width of the line, and is set in square type. Engravings may head advertisements at the same rate per square line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Star Lathes. Foot Power. Screw cutting. Automatic. Cross Feed. 9 and 12 inch Swing. New Designs. Novel Features. SENECA FALLS MFG. COMPANY.

LATHES. Shapers, Planers, Drills, Machine Shop Outfits, Foot Lathes, Tools and Supplies. Catalogue Free. SEBASTIAN LATHE CO.

FOOT POWER LATHES. For Electrical and Experimental Work. Gunsmiths and Tool Makers. General Machine Shop Work. Bicycle Repair Work. High Grade Tools. Correct in Principle. Elegant in Design. Superior in Construction.

THE BEST FOOT POWER LATHES MADE. W. F. & JOHN BARNES CO. 1999 RUBY STREET, ROCKFORD, ILLS.

AMERICAN PATENTS.—AN INTERESTING and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894.

A NEW PIPE WRENCH. Grips Quickly and Firmly, GALVANIZED as well as other Pipe, and will Not Crush it. Won't lock on pipe. Does not mar nut or highly polished fittings. Other features.

Samuel Hall's Son, 229 West 10th St., New York. Superior to Cotton Waste. Endorsed by Fire Underwriters. Safe, durable, cheaper. Agents wanted.

RAW SILK MACHINERY WIPERS. Beware of loose woven imitations. AMERICAN SILK MFG. CO. 313 Walnut Street, Philadelphia, Pa.

GNUGKS. WESTCOTT'S. Strongest Grip. Great Cutting Capacity and Durability. Cheap and Accurate. Westcott Chuck Co., Oneida, N. Y., U. S. A.

Seventeenth Edition of Experimental Science

EXPERIMENTAL SCIENCE. REVISED AND ENLARGED. 120 Pages and 110 Superb Cuts added. Just the thing for a holiday present for any man, woman, student, teacher, or anyone interested in science.

MUNN & CO., Publishers, Office of the SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK.

ELECTRICITY. Mechanics, Steam Engineering, Mechanical Drawing, Architecture, R. R. and Bridge Engineering, Plumbing, Heating, Mining, English Branches. Send for free circular.

STARRETT'S IMPROVED SPEED INDICATOR. Graduations show every revolution, and with two rows of figures, read both right and left as the shaft may run.

GOODNOW & WIGHTMAN. CATALOGUES FREE TO ANY ADDRESS. GEARS AND PARTS OF MODELS.

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.

"WOLVERINE" GAS AND GASOLINE ENGINES, STATIONARY and MARINE. The "Wolverine" is the only reversible Marine Gas Engine on the market.

BALL BEARING AXLES AND RUBBER TIRES.—A paper read before the Carriage Builders' National Convention, Philadelphia, October, 1894, showing the advantage to be derived from the use of ball bearings and pneumatic tires in road vehicles.

VANDUZEN STEAM PUMP. THE BEST IN THE WORLD. Pumps Any Kind of Liquid. Always in Order, never Clogs nor freezes. Every Pump Guaranteed.

A. W. FABER. Manufacturing Established 1761. LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS, COLORS AND ARTISTS' MATERIALS.

The "Climax" Stereotype and Moulding Press Combined, for making perfect Celluloid Stereotypes to be used in place of metal stereotypes. Also for making Rubber Stamps.

BUY TELEPHONES. That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits.

SINTZ GAS ENGINE CO. GRAND RAPIDS, MICH., U. S. A. Manufacturers of the Sintz Stationary and Marine Gas and Gasoline Engines.

HELLO, CENTRAL! Do you use telephones? If so, we can give you just what you want. Our specialty is Blake Transmitters. There is a "best" in everything, and ours are the best.

Chain BELTING of Various Styles, ELEVATORS, CONVEYORS, COAL MINING and HANDLING MACHINERY. The JEFFREY MANUFACTURING CO., COLUMBUS, O.

WELL DRILLING MACHINERY. MANUFACTURED BY WILLIAMS BROTHERS, ITHACA, N. Y. MOUNTED OR ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH STEAM OR HORSE POWER.

ARTESIAN WELLS—BY PROF. E. G. SMITH. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells.

PUMPING WATER BY COMPRESSED AIR. We take pleasure in announcing that by arrangements made with J. G. Poble, we are enabled to furnish our customers with the POHLE AIR LIFT PUMP.

ROCK DRILLS. AIR COMPRESSORS & GENERAL MACHINERY FOR MINING, TUNNELING, QUARRY & RAILROAD WORK. RAND DRILL CO. 23 PARK PLACE, NEW YORK.

ELECTRICITY AND PLANT GROWING.—A paper by Prof. J. H. Bailey, of Cornell University, describing and giving the results of a series of experiments upon the effect of electrical illumination upon the growth of plants.

"Pacific" & "Union" Gas & Gasoline ENGINES. Marine and Stationary. 1 to 75 h. p. Safe, Simple, Economical. THE GLOBE GAS ENGINE CO.

AMERICAN GAS FURNACE CO. of ELIZABETH, N. J., PATENTEES OF A Complete System for the generation of a CHEAP AND PERFECT FUEL GAS.

ROBERT POOLE & SON CO. ENGINEERS & MACHINISTS. TRANSMISSION MACHINERY. MACHINE MOULDED GEARING. SPECIAL FACILITIES FOR THE HEAVIEST CLASS OF WORK. BALTIMORE, MD.

SCIENTIFIC AMERICAN DYNAMO. Description of a plain shunt-wound dynamo of simple construction, capable of supplying a current of from 60 to 75 110-volt incandescent lamps.

CLARK'S PATENTED Rotary Upholstery Brush. Moth Exterminator. For cleaning Button Indentations in Furniture, Carriage Linings, Mattresses, etc.

FRANKLIN S. MILES, MANUFACTURER OF Brass, Iron, Steel & German Silver SCREWS. 205 Quarry Street, Philadelphia, Pa.

ELECTRICAL PHENOMENA ILLUSTRATED by Applied Hydraulics.—Mr. G. Claude's method of applying the movements of water to illustrate a few of the first principles of electrical phenomena.

MORSE UNIVERSAL DRAUGHTING TABLE. THE LARGEST AND MOST COMPLETE LINE OF DRAUGHTING ROOM FURNITURE. MANUFACTURED BY MORSE MACHINE CO. ROCHESTER, N. Y.

GATES ROCK AND ORE BREAKERS. GREATER CAPACITY USING LESS POWER THAN ANY OTHER ON EARTH. MODERN MINING MACHINERY OF EVERY DESCRIPTION.

How To Make a Dynamo OR MOTOR. 4 horse power size, illustrated with full working drawings. By Edw. Trevert. Price 10c. Bubier Publishing Co., Lynn, Mass.

They All Like It. The Ladies Like It. So Do The Men. Children Enjoy It. Layman Pneumatic Boats. See Sci. Am., May 18, 1896. Send 4c. in stamps for our handsomely illustrated catalogue.

ESTABLISHED 1845. 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.

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 full of engravings.

Building Edition. THE SCIENTIFIC AMERICAN BUILDING EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture.

Export Edition. of the SCIENTIFIC AMERICAN, with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN is published monthly, and is uniform in size and typography with the SCIENTIFIC AMERICAN.

Export Edition. 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. Rates upon application. MUNN & CO., Publishers, 361 Broadway, New York.