

Advertisements.

Inside Page, each insertion... 25 cents a line. Back Page, each insertion... \$1.00 a line.

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

ASBESTOS ROOFING. FIRE AND WATER-PROOF BUILDING FELT, FIRE-PROOF PAINTS, STEAM PACKINGS, BOILER COVERINGS, ETC.

HEATING BUILDINGS BY STEAM.—By J. H. Bartlett, M. Inst., M.E. A description of the Holly system of generating steam at a central point.

The only Real Treatise on the Subject. The Windmill as a Prime Mover. Comprehending everything of value relating to Wind-mills, their Use, Design, Construction, etc.

CLUTCH. The Ideal Friction Clutch will transmit any power. May be applied at any speed without a jerk.

THE DISCHARGE OF ELECTRICITY from clouds. Description, by Mr. Loudon, of a pretty experiment to illustrate some of the phenomena of thunder storms.

WITHERBY, RUGG & RICHARDSON. Manufacturers of Patent Wood Working Machinery of every description.

INTERNATIONAL INSTITUTE FOR Liquefied Carbonic Gas. O. BRUNLER, 357 Broadway, New York.

ON THE LIQUEFACTION OF GASES and other effects of extreme cold, and on some phenomena of high tension. By J. J. Coleman, F.C.S.

WM. A. HARRIS, Providence, R. I. (Park St.) Sixminuter/walk West from station. 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, and to act as Solicitors of Patents for Inventors.

PATENT RIVETED MONARCH RUBBER BELTING. Best in the World. Specially adapted for PAPER MILLS, SAW MILLS, and THRESHING MACHINES.

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.

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

Columbia Bicycles and Tricycles. CATALOGUE SENT FREE. The POPE MFG. CO., 597 Washington St., Boston.

ENGINEERING INVENTIONS SINCE 1862.—Address of Sir F. J. Bramwell before the Institution of Civil Engineers.—Bridges, construction, pneumatic foundations, tunnels, canals, and river improvement.

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

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

JENKINS STANDARD PACKING. Use the JENKINS STANDARD PACKING in the worst joint you have, and if, after following directions, it is not what we claim, WE WILL REFUND THE MONEY.

DRAINAGE.—A SERIES OF VERY excellent directions for draining railways, roads, etc., by Mr. Charles Faine. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 468.

A BIG OFFER. To introduce them, we will Give Away, 1,000 Self-Operating Washing Machines. If you want one send us your name, P. O. and express office at once.

MODERN BRONZE ALLOYS.—A Paper by P. P. Nourse, C.E., presenting some valuable data concerning such bronzes as are being usefully employed for engineering purposes.

THE "ACME" Automatic Safety Engine. 1, 2, and 4 horse power. Always ready. No engineer. No dirt. No noise. Cheap, reliable, economical.

THE CONVERSION OF HEAT INTO useful work.—A series of interesting lectures by Wm. Anderson, M. Inst., C.E., presenting the modern views connected with the conversion of heat into useful work.

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

THERAPEUTICAL EFFECT OF THE Internal Administration of Hot Water in the Treatment of Nervous Diseases.—By Ambrose L. Ranney, M.D.

HYDRAULIC FLANGED HEADS, OF IRON OR STEEL, FOR BOILER AND TANK MAKERS. Unequaled for Strength and Uniformity. THE DICKSON MANUFACTURING CO., SCRANTON, PA.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. CONN.

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

Plummer's Fruit Evaporators. Five hundred first premiums. (All sizes.) Over six thousand machines now in use. Send for catalogue.

PATENTEES and others desiring specialties manufactured, will find unequal facilities and low estimates by applying to THE JEWEL MANUFACTURING CO., Toledo, Ohio.

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

Use the JENKINS STANDARD PACKING in the worst joint you have, and if, after following directions, it is not what we claim, WE WILL REFUND THE MONEY.

ELECTRIC LEATHER BELTING. Best and most reliable Belt ever introduced. Made by C. A. SCHIEREN & CO., 47 Ferry St., New York; 416 Arch St., Philadelphia; 88 Federal Street, Boston.

GOLD MEDAL, PARIS, 1878. BAKER'S Breakfast Cocoa. Warranted absolutely pure Cocoa, from which the excess of Oil has been removed.

COPPER TUBES. SWEET BRASS BRASSWIRE. Mention this paper.

THE COPYING PAD.—HOW TO MAKE and how to use, with an engraving. Practical directions how to prepare the gelatine pad, and also the aniline ink by which the copies are made.

REGENERATIVE GAS FURNACES.—A new method of heating, by Frederick Siemens. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 472.

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.

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.

PUMPING MACHINERY.—BY E. D. Leavitt, Jr. Historical notes on machinery for mine pumping. Styles of pumps used in various well-known mines. Direct acting steam pumps. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 4492.

Machine Knives, L. & I. J. WHITE, BUFFALO, N. Y.

Planing, Moulding, Shingles and Stave, Hoop and Veneer. Plated Stock and Blanks for Moulding Cutters. Other Machine Cutters to Pattern. Moulding Cutters can be ordered by number from Univer al Moulding Book.

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.

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.

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.

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.

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.

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.

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