Adrertisements.

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 mornin to appear in next issue,

S HAFTING, PULLEYS, HANGERS, etc. a specialty. Send for Price List to A. & F. BROWN, 57-61 Lewis Street, New York.

A LIVE BUSINESS MAN.

GEO. MACDONALD. Auctioneer. Troy, N. Y., wants to take hold, with the owner, of some good patent and dig money out of it. He has a fine store in the best portion of the city, and has lots of time to give to such



Small Tools of all kinds; GEAR WHEELS, parts of MODELS, and materials of all kinds. Catalogues free. GOODNOW & WIGHTMAN. 176 Wash'n St., Boston, Mass.

Rare Chance to Advertise.

Next to the Scientific American, the Scientific American Supplement has the largest circulation of any newspaper devoted to science and the mechanical industries published in this country. The publishers have now decided to admit a few advertisements to the columns of the SUPPLEMENT at very low rates.

Contractors, dealers in Railroad Supplies, Bridge

Builders, Engine and Pump Manufacturers, Agricultural Implement Makers, and those engaged in all kinds of engineering enterprises, will find the SCIENTIFIC AMERI-CAN SUPPLEMENT specially adapted for advertising

Terms 25 cents a line each insertion. For large advertisements, or short advertisements for a long term, a discount will be allowed.

For special rates or other particulars, address

MUNN & CO., Publishers Scientific American, 37 Park Row, New York.



Mill Stones and Corn Mills.

We make Burr Milistones, Portable Mills, Smut Machirus, rackers, Mil. Pieks, Water Wheels, Patleys, and Gearling, specially adapted to Flour Mills. Sound for catalogue. J. T. NOYE & SON, Buffain, N. Y.

EMPIRE THRESHER

HAGERSTOWN, MD.

THE BEST IN THE WORLD. SEND FOR CIRCULARS.

The George Place Machinery Agency

Machinery of Every Description. Chambers and 103 Reade Streets, New York.

I CHALLENGE THE WORLD to produce an ointment that will cure more ills than the Golden Healing Ointment manufactured by J. L. Beattle. Patent rights for sale or lease by C. J. BEATTIE, of Pueblo, Colo.

Shafts, Polleys, Hangers, Etc. Full assortment in store for immediate delivery. WM. SELLERS & CO., 79 Liberty Street, New York.



NEW AND IMPROVED PATTERNS. Send for new illustrated catalogue.

Lathes, Planers, Drills, &c. NEW HAVEN MANUFACTURING CO. New Haven, Conn



Liquid Paints, Roofing, Boiler Coverings, H. W. JOHNS M'F'C CO. 87 NAIDEN LANE, N.Y.

DEAN'S STEAM PUMP,

DEAN BROS., INDIANAPOLIS, IND.

Boiler Feeders, Fire Pumps, Water Works, and Pumping Machinery for all purposes. Send for catalogue.



HARTFORD STEAM BOILER

Inspection & Insurance COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't. J. B. PIERCE, See'y.

THE HAGERSTOWN DRILL.



The most reliableand successful Grain Drills in use—can change quantities of seed while in medion—the SFA NDARD FERTILIZING DRILL of the Middle States, strong, durable, and simple, with our GUM SPRING HOE AND GRASS SEED ATTACHMENT. Manufacturers of the CELEBRATED VICTOR DOUBLE HULLER CLOVER MACHINE, the Best in the World. Mammfactured by HAGERSTOWN AGRICULTURAL IMPLEMENT U.C., Hagerstown, Ma.

DOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Saits, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc., JOHN W. THOMSON, successor to JAMES BogAk-DUS, corner of White and Elm Sts., New York.



Columbia Bicycle.

A practical road machine. The velociped of ISO is no more to be compared with the present Bicyclethan aspayined donkey with a blooded horse. Send 3c stamp for 24-page illus. cat., with full information.

THE POPE M'F'G CO.

SCIENTIFIC AMERICAN SUPPLEMENT.
Any desired back number of the SCIENTIFIC AMERICAN
SUPPLEMENT can be had at this office for 10 cents. May
also be had or ordered through booksellers and newsdealers everywhere. MUNN & CO. Publishers.
37 Park Row, New York.



Two new, invaluable Reference Books for Architects, Budders, Masons, and others.

POSTPAID ON RECEIPT OF PRICE.

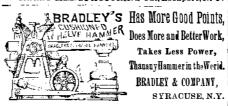
POSTPAID ON RECEIPT OF PRICE.
FOUNDATIONS & FOUNDATION WALLS
Pile Inviving. Building Stones and Brick.
Illustrations of Foundations. Pier and Wall Constrution, Mortars, Limes, Cements, Concretes,
Stuccos, &c.; 60 Illustrations.
One Vol., Svo, Cloth. Price \$1.50.

CAMERON'S PLASTERER'S MANUAL, Price, Cloth, 12mo, 75 Cents.



Holly's Improved Water Works.

Direct Pumping Plan. Combines, with other advantages, over older systems, the following: 1. Secures by variable pressure a more reliable water supply for all purposes. 2. Less cost for construction. 5. Less cost for maintenance. 4. Less cost for daily supply by the use of Holly's Improved Pumping Machinery. 5. Affors the best fire protection in the world. 6. Largely reduces insurance risks and premiums. 7. Dispenses with fire engines, in whole or in part. 8. Reduces fire epartment expenses. For information by descriptive pamphilet, or otherwise, address the HOLLY MANUFACTURING CO., Lockport, N. Y.



SYRACUSE, N.Y.

Wood-Working Machinery,

Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenen Machines, Mertising, Meuding, and Re-Saw Machines, Eastman's Pat. Miter Machines, and Wood-Working Machinery generally. Manufactured by WITHERBY, RUGG & RICHARDSON, 28 Subjoury Street, Worcester, Mass. 20 Samsoury Street, Worcest (Shop formerly occupied by R. BALL & CO.)

WITH THE "AIR SPACE" IMPROVEMENTS. THE CHALMERS-SPENCE CO., Foot E. 9th St., New York. Sole owners of the Air Space Patents

MISCELLANEOUS USEFUL RECIPES. A collection of attent 50 valuable recipes for the Household, Workshon, and Laboratory. How to make Skeleton Leaves. How to Preserve Autumn Leaves. How to rasks Sencoth and Rough Academy Bourds. Furificating Paper. Becipes for Schools Rice, Paste for Serios Books, Baibit, Mend and Fusible Metal. Passingerescent Paint for Check Dirts, etc. How to make Gelatine Monits for Pluster Custs. How to weld Horn. Recipes for Staining Horn Pflerent Colors. Waltul Stain. How to Render Chen. Program and Waterpoord. Muth and Roach Externibutor. To Color Batter. To Remove Staines From Marble. To Remove Mustisces from Casks. How to Make Sticky Fly Piper. Chamical Novellies: Recipe for Ivorita or Artificial Ivory. Artificia, Facil. New Chiers. Colors from Cook. Method of Preparing the Dyestaff "Muring." A new Mineral Gam. a Substitute for Bourn Arabic. Contained in Serios Titler. American Surplus Men., No. 159. The same number contains a valuable recipe for making a Superior Gum, and Directions for Keeping Fruit. Price 90 cents. To be had at this office, and from all newsteaders. MISCELLANEOUS USEFUL RECIPES



BIBB'S Celebrated Original Baltimore Heaters

Cigar Box Lumber,

MANUFACTURED by our NEW PATENT PROCESS. The Best in the World. SPANISH CEDAR, MAHOGANY, POPLAR.

Also thin lumber of all other kinds, 1/4 to 1/2 in., at corresponding prices. All qualities. Equal in all respects to any made, and at prices much under any to be obtained outside of our establishment. Send for price list.

GEO. W. READ & CO., 186 to 200 Lewis Street, N. Y

HOW TO REMOVE STAINS AND SPOTS The 1876 Injector.

Simple, Durable, and Reliable. Requires no special valves. Send for illustrated circular.

WM. SELLERS & CO., Phila.

Mechanical Department of Ohio State University. Best facilities in the West. Tuition free. Fully equipped Mechanical Laboratory. Address PREF. S. W. ROBINSON, Columbus, Ohio.

MACHINISTS' TOOLS.

New AND IMPROVED PATTERNS.

HOW TO REMOVE STAINS AND SPOTS from Limit, Cotton, Woolens, and Silk. Being a Table of Specific Directions, showing how to proceed in removing from each of the above the following character, to wit: Stains of Sugar, Glue. Blood, Albumen, Greese, Virginish, Oil, Faints, Stearlie, Vicetable Colors, Red Wine, Fruit Stains, Stearlie,

BIG PAY to sell our Rubber Printing Stamps. Samples free. Taylor Bros. & Co., Cleveland, O.

J. LLOYD HAIGH,





BRADFORD MILL CO.
Successors to Jas. Bradford & Co..
French O, French Buhr Millstones,
Portable Corn & Flour Mills,
Smut Machines, etc. Smut Machines, etc.

Also, dealers in Bolting Cloths and General Mill Furnishings. Office & Factory, 158 W. 2d St.

Lathes, Planers, Shapers Drills, Bolt and Gear Cutters, Milling Machines. Special Machinery. E. GOULD & EBERHARDT, Newark, N. J.

ICE AT \$1.00 PER TON.

Room 51, Coal and Iron Exchange, P O Box 3083, N. Y.

VALVE REFITTING MACHINES.
ALL USERS OF GLOBE VALVES SHOULD HAVE ONE. GRISCOM & CO., POTTSVILLE, PENN.

Leffel Water Wheels, With recent improvements.

Prices Greatly Reduced. 8000 in successful operation. FINE NEW PAMPHLET FOR 1879, Sent free to those interested. James Leffel & Co, Springfield, O. 110 Liberty St., N. Y. City.

('() Cards-20 Chromo, 10 Motto, 30 Ocean Shells, Snow-flake, etc., Name on, 10c. Clinton Bros. Clintonville, Ct.

IMPORTANT FOR ALL CORPORATIONS AND MANFG CONCERNS. -Buerk's Watchman's Fine Detector, capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular J. E. BUERK, P. O. Buy 979, Roston, Mass. Beware of buying intringing Detectors. THE DRIVEN WELI

Town and County privileges for making Driven Wells and selling Licenses under the established American Driven Well Patent, leased by the year to responsible parties, by

WM. D. ANDREWS & BRO., 235 BROADWAY, NEW YORK.



PERFECT

NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines and pamphlets has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 by mail, or \$1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.

MUNN & CO.,

THE TANITE CO., STROUDSBURG, PA.
EMERY WHEELS AND CRINDERS. LONDON—9 St. Andrews St., Holborn Viaduct, E.C. LIVERPOOL—42 The Temple, Dale St.



PATENTED ARTICLES, MACHINES, etc., manufactured in France according to the Laws by the Société Anonyme pour l'Exploitation de Brevets, 11 Rue de Flandre, Paris, France. References: Mackay Sewing Machine Association, Boston, Mass.

MINING MACHINERY. Engines, Boilers, Pumps, Coal and Ore Jigs, Dust Burning Appliances. Drawings and advice free to customers. Jeanesville Iron Works (J. C. Haydon & Co.). Address HOWELL GREEN, Supt., Jeanesville, Luzerne Co., Pa.

PHOSPHOR-BRONZE BEARINGS, PUMP-RODS.

Thospher Brenze SPRING WIRE.

THE PHOSPHOR-BRONZE SMELTING CO., Limited. 2038 Washington Ave., Philadelphia, Pa.

SPARE THE CROTON AND SAVE THE COST. Driven or Tube Wells





MIN GOLD AND SILVER
AMALGAMATING COMP'Y
of Norristown, Pa., will grant
state rights or licenses on
easy terms. This system
works up to assay, and recovers the mercury rapidly.
Apply as above.

WOODWORTH SURFACE PLANERS, \$124 Planers and Matchers, \$350. S. C. HILLS, 78 Chambers Street. New York.

\$10 to \$1000 Invested ir. Wall St. Stocks makes fortunes every month. Books sent free explaining everything.

Address BAXTER & CO., Bankers, 17 Wall St., N.Y.



COPYRIGHTS, TRADE MARKS, ETC.

Messrs. Munn & Co., in connection with the publication of the Scientific American, continue to examine Improvements, and to act as Solicitors of Patents for

In this line of business they have $% \mathbf{h}$ had over thirty YEARS' EXPERIENCE, and now have unequaled 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, Trade Mark Regulations, 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 moderate

We send free of charge, on application, a pamphlet The PICTET ARTIFICIAL ICE CO., containing further information about Patents and now to procure them; directions concerning Trade Marks, containing further information about Patents and how Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, free of charge, a Synopsis of Foreign l'atent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five patents-embracing Canadian, English, German, French, and Belgian-will secure to an inventor the exclusive monopoly to his discovery among about one HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is \$75; German, \$100; French, \$100; Belgian, \$100; Canadian, \$50.

Copies of Patents .- Persons desiring any patent is ued from 1836 to November 26, 1867, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office \$1

A copy of the claims of any patent issued since 1836

will be furnished for \$1. When ordering copies, please to remit for the same as above, and state name of patentee, title of inven-

tion, and date of patent. A pamphlet, containing full directions for obtaining United States patents sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every patentee and mechanic, and is a useful hand book of reference for everybody. Price 25 cents, mailed free.

MUNN & CO.,
Publishers SCIENTIFIC AMERICAN, 37 Park Row, New York, BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

JNN & CO.,
Publishers Scientific American.

THE "Scientific American" is printed with CHAS.
ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 50 Gold St., New York.