Advertisements.

Inside Page, each insertion - - - 75 cents a line. Back Page, each insertion --- \$1.00 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 Friday morning to appear in next issue.

CUARDIOLA'S

COFFEE & SUGAR MACHINERY Coffee, Malt. Corn, Cocoa, and Grain-Drying Machine. Coffee-Hulling and Polishing Machines. Coffee-Washing Machine. Helix Sugar Evaporator.

Mesers. C. A DOLPHE LOW & CO., 42 Cedar Street, Mesers. MUNOZ & ESPRIELLA, 52 ine Street, New York, are Mr. Guardiola's Agents, and they will give prompt attention to all orders for any of the above machines.



Best Tempered Cast Steel. Retail Price, 9 Cents per lb. WARRANTED. Fend for Circular Fisher & Norris, Trenton, N. J.

FOUR GRAND PRIZE MEDALS! Awarded Our Exhibit at the Centennial!



Bliss's Illustrated Seed Catalogue and Amateur's Guide to the Flower and Kitchen Garden-20 pages, including several hundred finely executed engayings, and a beautifully colored liberra page Central Bliss's Illustrated Gardener's Almanac and Abridged Catalogue.—128 pages Embraces a monthly calendar of operations, and a price list of all the leading Garden, Field and Flower Seeds, profusely illustrated, with brief directions for their culture. 10 cents.

Blies's Illustrated Potato Catalogue contains a descriptive list of all the varieties recently introduced, with many other desirable sorts; also much useful information upon their cultivation. 10 cents.

B. K. BLISS & SONS,

34 BARCLAY ST., (P. O. BOX 5712.) NEW YORK.

Please state that you saw this advertisement in the
SCIENTIFIC AMERICAN.



[ESTABLISHED 1846.]

Mana & Co'.s Patent Offices.

The Oldest Agency for oliciting Patents in the United States.

THIRTY YEARS' EXPERIENCE.

MORE PATENTS have been secured through this gency, at home and abroad, than through any other in the world.

They employ as their assistants a corpsof the most experienced men as examiners, specification writers, and draughtsmen, that can be found, many of whom have een selected from the ranks of the Patent Office.

SIXTY THOUSAND inventors have availed themselves of Munn & Co.'s services in examining their inventions and procuring their patents.

MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine inventions, confer with inventors, prepare drawings, specifications, and assignments, attend to filing applications in the Patent Office, paying the Government fees, and watch each case, step by step, while pending before the examiner. This is done through their oranch office, corner F and 7th Sts., Washington. They also prepare and file caveats, procure design patents, trade marks, and re-issues, attend to rejected cases (prepared by the inventor or other attorneys) procure copyrights, attend to interferences, give written opinions on matters of infringement, furnish copies of patents, and, in fact, attend to every branch of patent business, both in this and in for-

eign countries.

A special notice is made in the SCIENTIFIC AMER-ICAN of all inventions patented through this agency, with the name and residence of the patentee. Patents are often sold, in part or whole, to persons attracted to

the invention by such notice.

Patents obtained in Canada, England, France, Belgium, Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted, at prices greatly reduced from former rates. Send for pamphlet pertaining specially to foreign patstates the cost, time quirements for each country.

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at rea sonable 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 of-

A copy of the claims of any patent issued since 1638 will be furnished for \$1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, 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 handbook of reference for everybody. Price 25 cents, mailed free.

Address

MUNN & CO., Publishers SCIENTIFIC AMERICAN, 37 Park Row, N. Y.

BRANCH OFFICE-Corner of F and 7th Streets.



1,000,000 extra bits sold per year.

"Dover, Kentucky."
"Yesterday, by accident, by the log springing and drawing the headblock forward, we sawed the end of it clear off, which is of whousement iron, 3 inches by 1/2 inch thick; thirty bits, costing 90 cents, was the only damage to the Planer Saw. In twenty minutes it was running again all right. Signed, AARON HICKS, of the firm of Messrs. Hess & Co., and certified to by Wm. A. Sprott, a Millwright and Architect.
"D. L. Emerson, Oakland, Cal., Agent for Pacific Coast."

"Your 54 inch *Planer Saw*, in H. P. Stanton's Mill, sawed 45,506 feet of hemlock lumber with one set of Bits (30), just as they came from your works, without sharpening, and never made a bad run; has that ever been beat?

E. E. Barten, Millwright."

N. B.—Read next week's advertisement. TF For circular and price list, send your address, plainly written, to Emerson, Smith & Co., Beaver Falls, Pa., successors to Emerson, Ford & Co.

MACHINERY OF IMPROVED STYLES FOR making SHLNGLES, HEADING and STAVES; also GUAGE LATHES for TURNING HANDLES. Sole makers of Law's Pat. Shingle and Heading Sawing Machine. Address TREVOR & CO., Lockport, N. Y.

Incombustible Mineral Wool

The best and cheapest insulator of heat or cold. Send for ci culars, 26½ Broadway, New York.

ALEXANDER D. ELBERS,
Agentforthe Patentee.

JOS. G. ROGERS & CO., MADISON, IND. wish to place a consignment of their Tannate of Soda BOILER SCALE PREVENTIVE in all important towns in the United States, to be sold on commission. Applica-tions solicited. Send for book on Boiler Incrustation.

THE HOADLEY
PORTABLE STEAM ENGINE.
WITH AUTOMATICAL CUT-OFF REGULATOR
AND BALANCED VALVE.
THE BEST & MOST ECONOMICAL ENGINE MADE The J.C. HOADLEY CO. LAWRENCE, MASS.

NON-COMBUSTIBLE STEAM BOILER AND PIPE

Brayton Ready Motor It has no otler, is safe, economical, started by any one in one minute, occupies small space, and gives an unsurpassed steady, reliable power. Address

Penna. Ready Motor Co., 20 N. 4th St., Philadelphia, Pa

MILL FURNISHING WORKS

are the largest in the United States. They make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills. Send for Catalogue.

J. T. NOYE & SON, Burfalo, N. Y.

ed of All at Centennial, Hand and Seif-inking.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS. Send for new illustrated catalogue.

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

HARTFORD

STEAM BOILER

Inspection & Insurance COMPANY.

W. B. FRAUKLIU, V. Pres't. J. M. ALLEU, Pres't. I. B. PIERCE. SACY.

ROCK DRILLING MACHINES AIR COMPRESSORS

MANUFACTURED BY BURLEICH ROCK DRILL CO.
SEND FOR PAMPHLET. FITCHBURG MASS. Tube Cleaners for cleaning Boiler Tubes. THE NA-

DROP FORGINGS and MACHINERY, THE HULL & BELDEN CO., Danbury, Conn.

Working Models

And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 62 Center St., N. Y.

LeCOUNT'S PATENT Machinists' Tools.

DAMPER REGULATORS **BEST** GAUGE COCKS.
MURRILL & KEIZER, 44 HOLLIDAY ST., BALTIMORE

DUC'S IMPROVED PATENT ELEVATOR BUCKET, FOR BREWERS, FLOUR MILLS, GRAIN ELEVATORS, SUGAR REFINERS, &C.



These buckets are made of the best char-coal stamping iron, and are warranted to outwear six of the "eldstyle Buckets." The cost is about the same Address T. F. ROWLAND, Brooklyn, E. D., N. Y.

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, Salts, 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 BOGARDUS, corner of White and Elm Sts. New York.



Niagara Steam Pump Works.

ESTABLISHED 1826.

CHARLES B. HARDICK, o. 23 Adams Str BROOKLYN, N. Y.

COMMON SENSE CHAIRS AND ROCK-ERS. Solid comfort all around the house. Send stamp for Illu trated Price List to F. A. SINCLAIR, Mott ille, N. Y. For sale by the *Trade*.

PATENT

The fact that this shafting has 75 per cent. greater strength, a finer finish, and is truer to gauge, than any other in use, renders it undoubtedly the most economical other in use, renders it undoubtedly the most economical We are also the sole manufacturers of the CELEBRATED COLLINS'PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS, Try Street, 2d and 3rd Avenues, Pittsburgh, Pa. 190 S. Canal Street, Chicago, Ill., and Milwaukie, Wis.

**Example of the Street of the Stree

ENOWLES STEAM PUMP WORKS, 92 & 94 Liberty St.. New York. "Great reduction in prices. Send for catalogue. The "Knowles" has always been the best steam pump made.

SCOTTISH-AMERICAN JOURNAL, PUBlished weekly, contains a full summary of general news; of every county in Scotland; of Scotsmen in America; and departments relating to the Home, Workshop, Science, Story, Wit, &c. Specimen copy free. A. M. STEWART, 37 Park Row, N. Y.

Before purchasing Paints or Roofing, send for Samples, and Reduced Price-List of



ASBESTOS ROOFIN the only reliable stand

ard, low-priced Roofing. It is furnished in rolls ready for nalling to the roof, weighs only about 60 hs. to 100 square feet, and when finished with the FIRE-PROOF Absence Coating presents a handsome white or light-gray surface. It is adapted for steep and flat roofs in all climates, costs only about half as much as tin, and can be readily applied by any one.

For Do not be deceived by worthless materials which are represented by unscrupulous parties as genuine ASESTOS ROOFING. THERE IS NO OTHER RELIABLE PORTABLE ROOFING IN THE MAKET. The cheap, tarred felts, petroleum oil paints &c., which are sold as Roofings under various names, and warranted by irresponsible venders to be more durable than the standard articles, are source of con tant amoyance and expense while a reliable Roofing from reputable manufacturers can be purchased at about the same price asked for base worthless articles.

irresponsible venders to be more qurant that the standard according to the same price asked for pense, while a reliable Roofing from reputable manufacturers can be purchased at about the same price asked for these worthless articles.

ABESTOS ROOF PAINT.—This is a better article than has ever before been offered for this purpose. It contains not are or cheap of an afforms the handsomest and most durable preservative coating in use, for tin and other roofs, from work, fences, outbuildings, etc. It is furnished ready for use in packages of all sizes.

ABESTOS PAINTS.—These Paints are in every respect strictly first-class, and second to no others in the market in purity, richness, and permanency of color, beauty of finish, and durability. They are prepared ready for the brush, in twelves newest shapes, suitable for the tasteful decoration of all classes of buildings. They possess a superior body, and are more economical than any others, two coats being fully equal to three of any of the various liquid chemical paints, which contain water, alkali, soap, etc. Send for samples.

We quarantee these paints to be the best in the world for peneral structural purposes.

ASESTOS STEAM-PIPE AND BOILER COVERINGS.—The most durable and effective non-conductors in use—proved superior to all others in U. S. Government tests—a perfect insulator for hair felts, rendering them indestructible.

ASESTOS STEAM PACKING.—Made'from pure long-fibre ASBESTOS. Self-Lubricating; Indestructible. ASBESTOS STEAM PACKING.—Made'from pure long-fibre ASBESTOS. Self-Lubricating; Indestructible. ASBESTOS FIRE-PROOF PAINT for wood-work. ASBESTOS Self-Lubricating; Indestructible. ASBESTOS FIRE-PROOF PAINT for wood-work. ASBESTOS CEMEN' for repairing acid and gas retorts, leaky roofs, etc. ASBESTOS BOARDS, PAPER. THREAD, CLOTH, SHEATHING, AND LINING FELTS, etc. All these materials are prepared for use in neat and compact form, ac suitable for all chmates, and can be easily applied by any one. Liberal inducements to General Merchants, Dealers, and Large

H. W. JOHNS MANUFACTURING COMPANY, 87 MAIDEN LANE, NEW YORK.

SEND FOR SAMPLES, ILLUSTRATED PAMPHLETS, PRICE-LISTS, ETC Also for sale by DOWNIE TRAINER & CO., Boston; S. W. HEMPSTED & CO., Columbus, O.; T. S. & A. J. KIRKWOOD, Chicago; M. M. BUCK & CO., St. Iouis; H. D. COLEMAN & BRO., New Orleans; THOMPSON & UPSON, San Francisco.

13 CAUTION.—The public are cautioned against purchasing or using any materials for the above or similar purposes, purporting to contain ASBESTOS, unless they bear our name and dates of patents.

poses, purporting to contain ASBESTOS, unless they bear our name and dates up putches.

When writing, please state you saw this advertisement in the Scientific American,

EMERSON'S PATENT Nearly 1,000 in operation, and READ! READ!! READ!!! THE TANITE CO. STROUDSBURG, PA. EMERY WHEELS AND CRINDERS. GEO, PLACE, 121 Chambers St., New York Agent.

\$5 to \$20 per day at home. Samples wor h \$5 free. STINSON & Co., Portland, Me.

EAGLE FOOT LATHES with Scroll and Circular Saw Attachments, Shdc Rest, Tools, &c.; also Small Engine La thes. Metal Hand Planers, &c. Neatest designs, superior finish. Low Prices. Our new Catalogue describes these and every tool necessary for the Amateur or Artisan. Send for it.

wM. L. CHASE & CO.,

55 & 97 Libertv St. New York,

Pyrometers, For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Super-Heated Steam, Oil Stills, &c.
HENRY W. BULKLEY, Sole Manufacturer, 149 Broadway, New York.

A. S. CAMERON'S

PATENT

"SPECIAL" Steam Pump Is the Standard of Excellence at home and abroad.

REDUCED PRICE LIST.

Number.	PRICE.	Steam Cyl.	Pump Cyl.	Stroke.
	\$ 50 7.5	3½ in.	2 in.	4 6
2 3	100 150	5	3%	6 7
:5 6	200. 275	7	372	18
3	400 425	10 10	8	12 12
9 10	480 250	12 14 16	10%	12 15
12	836	18	12"	18

Illustrated Catalogue sent free, on application to the Inventor and Sole Manufacturer in the United States,

A. S. CAMERON,

Works, Foot of East 23d St. NEW YORK CITY.

ESTABLISHED 1844

JOSEPH C. TODD (Formerly of Todd & Rafferty), ENGINEER and MACHINIST. Flax, Hemp, Jute, Rope, Oakum, and Bagging Machinery, Steam Engines, Boilers, etc. Also Agent for the celebrated and improved Rawson & Rittinger Hoisting Engine, I will furnish specifications and estimates for all kinds of machinery. Send for descriptive circular and price. Address

J. C. TODD,

10 Barclay St., New York, or Paterson, N. J.



SCIENTIFIC AMERICAN For 1877,

THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

THIRTY-SECOND YEAR.

VOLUME XXXVI.—NEW SERIES.

The publishers of the SCIENTIFIC AMERICAN beg to announce that on the sixth day of January, 1877, a new volume was commenced. It will continue to be the aim of the publishers to render the contents of the new volume more attractive and useful than any of its

To the Mechanic and Manufacturer.

No person engaged in any of the mechanical pursuits should think of doing without the Scientific American. Every number contains from six to ten engravings of new machines and inventions which cannot be found in any other publication.

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 and twenty cents by the publishers.

One extra copy of the Scientific American will be supplied gratis for every club of five subscribers at \$3.20 each; or six copies for \$16.50 without extra copy.

The Scientific American Supplement.

A weekly paper, uniform in size with the SCIENTIFIC MERICAN, but a distinct publication. It contains work ing drawings of engineering works, and elaborate treatises on every branch of Science and Mechanics, by eminent writers, at home and abroad. An illustrated cover protects the handsomely printed sheets. Price, \$5.00 per annum. Single copies 10 cents.

One copy of the Scientific American and one copy of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of seven Dollars by the publishers.

The safest way to remit is by Postal-Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and carefully addressed, seldom goes astray: but it is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 37 PARK ROW, NEW YORK.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 59 Gold St., New York.