

Advertisements.

Inside Page, each insertion --- 25 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.



KORTING UNIVERSAL INJECTOR
DOUBLE TUBE.
FOR BOILER FEEDING.
Operated by one handle.
WILL LIFT HOT WATER.
POSITIVE ACTION GUARANTEED UNDER ALL CONDITIONS.
NO ADJUSTMENT FOR VARYING STEAM PRESSURE.
WILL LIFT WATER 25 FEET. SEND FOR DESCRIPTIVE CIRCULAR.
OFFICES AND WAREHOUSES:

Philada., 12th & Thompson Sts.
Boston, 61 Oliver St.
Augusta, Ga., 1026 Fenwick St.
San Francisco, Cal., 2 California Street.
New York, 109 Liberty Street.
Denver, Col., 48 Blake Street.
Chicago, Ill., 204 Lake St.

H.W. JOHNS' ASBESTOS PISTON PACKING.

Our improved elastic Asbestos Piston Packing is composed of the best quality of pure Asbestos fiber, and forms the most perfect, compact, and durable packing ever produced for locomotive, marine, and other engines, valve-stems, etc. It requires less oil than any other, being to a great extent self-lubricating, and wears ten times as long as ordinary packings. It is proof against acids.

Asbestos Wick Packing,
Asbestos Mill Board,
Asbestos Gaskets and Rings,
Asbestos and Rubber Tapes and Cloth.

Asbestos Boiler Coverings.

Our ASBESTOS CEMENT FELTING is the most effective and durable non-conducting covering for STEAM PIPES, BOILERS, STILLERS, and other Steam-Heated Surfaces. It is composed of Asbestos fibre and a cementing compound, which forms a light, porous covering, partaking of the nature of a felt and a cement. It can be easily applied by any one.

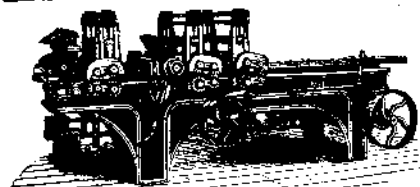
Asbestos Hot Blast Cement Felting,
Asbestos Air Chamber Covering,
Asbestos Locomotive Lining,
Asbestos and Hair Woven Felt.

We also manufacture Asbestos Cloths, Asbestos Cord Twine, Yarn, and Sewing Twine, Asbestos Sheathing, Asbestos Paper, Asbestos Gasket and Retort Cements, Sheathing Felts, Etc., also the Standard

ASBESTOS ROOFING
LIQUID PAINTS, PURE COLORS, ETC.
DESCRIPTIVE PRICE LIST AND SAMPLES FREE.

H.W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.
175 Randolph St., Chicago. 170 N. 4th St., Philadelphia.
Billiter House, Billiter Street, London.

MARITIME METEOROLOGY.—BY Thompson B. Maury. A valuable paper for navigators, embracing: Classification of the winds of the globe. The laws governing the origin and movements of cyclones or hurricanes. Hints for handling ships in or near cyclones. Researches in ocean meteorology. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270. Price 10 cents. To be had at this office and from all newsdealers.



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

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 OFFICE.—Corner of F and 7th Streets,
Washington, D. C.

JENKINS BROS.' VALVES.
Gate, Globe, Angle, Check, and Safety.
MANUFACTURED OF BEST STEAM METAL.
Are the acknowledged standard of the world. Have been in use since 1868, under all possible conditions, and never have failed.
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.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 17 Liberty Street, New York. Wheels and Rope for conveying power long distances. Send for circular.

BOULIER'S UNIVERSAL PYROMETER.
—Full description of the apparatus, illustrated with 3 engravings showing details and mode of application. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 445. Price 10 cents. To be had at this office and from all newsdealers.

COLUMBIA BICYCLES & TRICYCLES
BRANCH HOUSES
12 WARREN ST. NEW YORK
179 MICHIGAN ST. CHICAGO
Catalogue sent free
THE POPE MFG. CO.
557 WASHINGTON ST. BOSTON, MASS.

HOW TO COLOR LANTERN TRANSPARENCIES.—A valuable paper by T. J. Houston giving full directions for the preparation of photographic transparencies, and for painting them. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 443. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an illustrated paper on improvements in Photo-block Printing.—Another valuable paper on the Preparation on Lantern Transparencies is contained in SUPPLEMENT, No. 424.

COMMON SENSE CHAIRS AND ROCKERS.
Sting, durable, and comfortable. No light, trashy stuff, but good, honest home comforts. Special discount to clergymen. Send stamp for catalogue to
F. A. SINGLAI.
Mottville, Onondaga County, N. Y.
For sale by all first-class Furniture Dealers.

SEBASTIAN, MAY & CO.'S IMPROVED \$60 Screw Cutting Lathe.
Designed for actual work; no toy. Lathes for wood or metal. Drill Presses, Chucks, Drills, Docks, and machinists' and amateurs' outfits. Lathes on trial. Catalogues mailed on application.
187 West Pearl Street, Cincinnati, Ohio.

BOOKWALTER 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
1 HORSE POWER \$240 00
2 " " 330 00
3 " " 350 00
4 " " 400 00
Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

ON THE ECONOMIC APPLICATIONS OF SEAWEED.—By Edward C. C. Stanford, F.R.S.—Seaweed as manure. The manufacture of kelp, Iodine and potash salts. Algin or sodium alginate and its economic uses. A valuable paper. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 445. Price 10 cents. To be had at this office and from all newsdealers.

ROOT'S NEW IRON BLOWER.
POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNEERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 23 Cortland St., 9 Day St.,
COOKE & CO., Selling Agts., 22 Street and Street,
JAS. BEGGS & CO., Selling Agts., 9 Day Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

SAWS Wanted 50,000 Sawyers and **SAWS** full address for a copy of the **Book of SAWS.** We are first to introduce **NATURAL GAS** for heating and tempering **SAWS** with wonderful effect upon improving their quality and toughness, enabling us to reduce prices. Address
EMERSON, SMITH & CO. (Ltd.),
Beaver Falls, Pa.

IMPROVEMENTS OF PRAIRIE ROADS and Streets. By T. J. Nicholl, C.E. Economical and Practical Suggestions, with six figures; on Width, Drainage, Ditching, Rolling Soils, Culverts, and Cost. How to keep in repair. Laying out the Streets or a Town, with Cost, and Repairs needed, etc. SUPPLEMENT 150. Price 10 cents.

THE PAYNE AUTOMATIC ENGINE
Gives more power from same amount of fuel and water than any engine made, and 50 per cent more power than rated at. All engines warranted. All sizes and styles, 2 to 250 horse power. Send for prices and catalogue to
H. W. PAYNE & SONS,
P. O. Box 1207, Elmira, N. Y.
Or our General Sales Office, 83 Liberty St. & 149 B'way, N.Y.

ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents wanted. T. NEW, 32 John Street, New York.

THE ONLY PRACTICAL ELECTRIC MOTORS
FOR FAMILY SEWING MACHINES.
THE ELECTRO-DYNAMIC CO. PHILA.
224 CARTER ST. PHILADELPHIA, PA.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED stronger than any other Vise by **EAGLE ANVIL WORKS** only, Trenton, N. J.

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

A SHOE THAT WILL NOT PINCH.—By Benjamin Lee, M.D. A study of the hygiene of the feet, pointing out how a shoe should be made in order to conform to the true shape of the foot. Illustrated with 8 diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 444. Price 10 cents. To be had at this office and from all newsdealers.

Free TRIAL. Send for NERVITA, a reliable (and for Nervous Debility, Lost Manhood, Premature Emission, etc.) trial package mailed for 12 cents. Pay postage etc. D. A. A. Box 240, CHICAGO, ILL.

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.

FIRE BRICK. THE AND CLAY RETORTS ALL SHAPES.
BORGNER & O'BRIEN
23 1/2 ST. ABOVE RACE, PHILADELPHIA.

A SIMPLE PANTOGRAPH.—DESCRIPTION and figure of a cheap form of pantograph, noteworthy on account of its compact form and its simplicity. As the instrument is capable of describing a circle of four feet radius, drawings of considerable size can be reduced by it. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 242. Price 10 cents. To be had at this office and from all newsdealers.

PIPE COVERING.

FIBROUS ASBESTOS REMOVABLE COVERINGS.
Fireproof Non-conducting Coverings for Steam Pipes, Boilers, and all hot surfaces. Made in sections three feet long. Easy to apply. **Asbestos Materials—Fiber, Millboard Packing, and Cement.**
CHALMERS-SPENCE CO.,
419-421 Eighth St., New York.

ICE-BOATS — THEIR CONSTRUCTION and management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sailing boats used on the Hudson river in winter. By H. A. Horefall, M.E. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270. The same number also contains the rules and regulations for the formation of ice-boat clubs, the sailing and management of ice-boats. Price 10 cents.

AUSTRALIA. Bona fide American Manufacturers wishing to be represented in these colonies please communicate with Messrs. Imray & Co., Australian Agents, 28a Basinghall St., London, E. C., and at Sydney and Melbourne.

GAS CONSUMERS.
The use of our Improved Moderator will save you 15 to 40 per cent. No less, no more, or more. It is the best. Simple, reliable, accurate, metallic. Works where others fail. **HOWARD BROS. & CO.,**
164 West Broadway, N. Y.

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY.
W. H. FORBES, W. R. DRIVER, THO. N. VAIL,
President. Treasurer. Gen. Manager.
Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which undulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them. This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake Phelps, Watson, and others.
Descriptive catalogues forwarded on application.
Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.
All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against. Information furnished upon application.
Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

The "MONITOR."
A NEW LIFTING AND NON-LIFTING INJECTOR.
Best Boiler Feeder in the world.
Greatest Range yet obtained. Does not Break under Sudden Changes of Steam Pressure.
Also Patent **EJECTORS** OR Water Elevators. For Conveying Water and Liquid. Patent Office, Lubricators, etc.
NATHAN MANUFACTURING COMPANY,
Send for catalogue. 92 & 94 Liberty St., New York.

CABINET WOODS AND MAHOGANY.

GEO. W. READ & CO.,
BAND AND VENEER SAW AND CUTTING MILLS,
186 to 200 LEWIS STREET, N. Y.

ON THE STABILITY OF CERTAIN Merchant Ships.—Short abstract of a paper on this subject read by Mr. W. H. White before the Institution of Naval Architects; followed by a paper by Mr. Hamilton on "Waves Raised by Paddle Steamers and their Positions Relatively to the Wheels," wherein the author considers two sources of loss of power in steamers—(1) the energy absorbed in creating and maintaining waves, and (2) the effect of this wave formation on wheels. Illustrated with five figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 283. Price 10 cents. To be had at this office and from all newsdealers.

Rider's New and Improved COMPRESSION Hot Air Pumping Engine
New and Improved Designs.
INTERCHANGEABLE PLAN
MANUFACTURED BY
DELAMATER IRON WORKS,
C. H. DELAMATER & CO., Proprietors,
No. 16 CORTLAND ST., NEW YORK, N. Y.
And 40 Dearborn Street Chicago, Ill.

HOW TO PREPARE LANTERN SLIDES.—Formula for an uncolored collodio-bromide emulsion with free bromide, with full directions for use in making plates for lantern slides. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 444. Price 10 cents. To be had at this office and from all newsdealers.

NOTICE to Users of Steam Pumps.
We have received following letter in regard to one of our No. 5 L. (80) Steam Jet Pumps elevating 1 1/2 inch pipe of water more than 50 feet high:
"I'ANSE, MICH., Feb. 24, 1883.
"VAN DUZEN & TIFT, Cincinnati, O.:
"Money could not buy the Jet of us unless another could be had. I would not give you No. 5 L. for a \$700 pump, equal distance to raise.
"N. A. Litchfield, Supt. Mich. Slate Co."
We make Ten Sizes of these Pumps. Prices \$7 to \$75. Capacities 100 to 30,000 gallons per hour. State for what purpose wanted and send for Catalogue of "Pumps."
VAN DUZEN & TIFT, Cincinnati, O.

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, \$5.20 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.