Advertisements.

Inside Page, each insertion - - - 75 cents a line. Back Page, each insertion - - - \$1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be seceived at publication office as early as Thursday morning to appear in next issue.





FIREAND WATER-PROOF BUILDING FRIT PAINTS, STEAM PA COVERINGS, ETC.

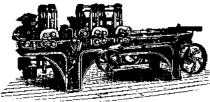
Samples and descriptive Price List free by mail. H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y. PHILADELPHIA.

HEATING BUILDINGS BY STEAM.—
hy J. H. Bartlett. M. Inst., M.E. A description of the
Bolly system of generating steam at a central point,
transmitting it by mains to suitable distances, and utilizing it for heat or power by means of mechanical devices. With 3 engravings. Continued in SCIENTIFIC AMERICAN SUPPLEMENT NO. 447. Price 10 cents. To be had at this office and from all newsdealers.



NO LOST MOTION. INSTANTANEOUS GRIP T. C. MASSEY, Sole Mfr. 15 So. Jefferson St., Chicago 81 John St., N. Y.

THE DISCHARGE OF ELECTRICITY from clouds. Description, by Mr. Loudon, of a pretty experiment to illustrate some of the phenomena of thunder storms. With one figure. Contained in SCIENTIFIC AMBRICAN SUPPLEMENT, No. 493. Price 10 cents. To be had at this office and from all newsdeal-



WITHERBY, RUGG & RICHARDSON, Manufacturers or ratent wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co.. Worcester, Mass. Send for Catalogue.

VERCOME.

Perfect hearing secured by the Micro-Audiphone. Scienically constructed. Accurately performs all functions of saring. Sound collected, reflected, conducted and intension. Satisfaction guaranteed. Patented in all countries. instructed circulars and testimonials sent free. Address ICRO-AUDIPHONE Co., 207 W. 34th St., N. Y. City.

Will be sent on trial. Send for instructions for measurement of ears. (Mention this Paper).

The only Real Treatise on the Subject. The Windmill as a Prime Mover.

Comprehending everything of value relating to Windmills, their Use, Design, Construction, etc. With many fine flustrations. By A. R. WOLFF, M. E., Consulting Engineer. 8vo, cloth, \$3.00 Mailed prepaid on the receipt of the price. Address

MUNN & CO., 361 Broadway, New York.

WM. A. HARRIS, Providence. R. I. (Park St.) Six minutes' walk West from station Original and Only Builder of the HARRIS-CORLISS ENCINE With Harris' Pat. Improvements, from 10 to 1,000 H. Send for copy Engineer's and Steam User Manual. By J.W. Hill, M.E. Price \$1.25.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to ex amine improvements, and to act as Solicitors of Patents for Inventors

In this line of business they have had forty one 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, 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 OFFICES.—No. 622 and 624 F Street, PacificBuilding, near 7th Street, Washington, D. C.

A FAIR OFFER.

If you will put a **JENKINS BROS. VALVE** on the worst place you can find, where you cannot keep other Valves tight, and if it is not perfectly tight or does not hold Steam, Oils, Acids. or other fluids longer than any other Valve, you may return it, and your money will be refunded

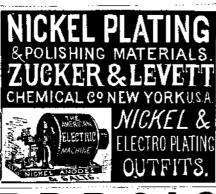
To avoid imposition, see that valves are stamped "Jenkins Bros."

JENKINS BROS.,

71 John St., New York.

13 So. Fourth St., Phila.

79 Kilby St., Boston.



GRATEFUL-COMFORTING.

Popular Science News for October

Contains two articles of unusual interest: A Look through the great Object Glass just completed for the Lick Observatory, by Prof. C. A. Young, and a description of the Skull of a Mound Builder, illustrated by drawings from a cast, by Dr. S. F. Landrey. Price 10 cents, or the paper will be sent till January, 1888, including the October number, on receipt of one dollar, the regular subscription price. Address,

POPULAR SCIENCE NEWS COMPANY, 19 PEARL STREET, BOSTON. MASS. SHEPARD'S NEW \$60



Serew-Cutting Foot Lathe.

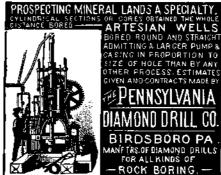
Foot and Power Lathes, Drill Presses, Scroll-saw Attach-ments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Lathes on trial. Lathes on

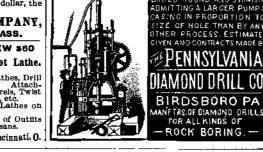
payment.
Send for catalogue of Outits
for Amateurs or Artisans. Address H. L. Shepard, Agent, 134 E. 2d St., Cincinnati, O.

THORD STEAM PORTORIOR



\$10.00 to \$50.00 per night. A light and proper night. A light and propers. Magic Lanterns and Views of popular subjects. Catalogues on application. Part 1 Optical, 2 Mathematical, 3 Meteorological, 4 Magic Lanterns, etc. L. MANASSE, 88 Madison Street, Chicago, Ill.





- HARRISON CONVEYOR!

Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, & C. Send for BORDEN, SELLECK & CO., { Sole Manu'rers, } Chicago, III.

STEWART'S ANTI-INCRUSTATION SOLUTION

Will successfully remove all Scale from Boilers, and positively preventany new formation. A trial solicited. Satisfaction guaranteed. RAND, HARMER & CO., Sole Manufacturers, N. K. Corner Ith and Fibers Sts., Philadelphia, Pa.



SAWS Wanted 50,000 Sawyers and SAW S full address for a copy of Emerson's ET Book of SAWS. We are direct to introduce Natural Gas for heating and tempering Naws With wonderful effect upon improving their W quality and toughness, enabling us to reduce with the same of th

EMERSON, SMITH & CO. (Lid.), Benver Falls, Pa. S

TEREOPTICONS, all prices. Views ill abject for PUBLIC EXHIBITIONS, profitable business for a man with a small capital

Lauterns for Home Amasement. 148 page Catalogue Ace. McALLISTER, Mg. Opticien, 49 Nassau St., N. V.



Mention this paper.



STEAM ENGINES

Horizontal and Vertical. Dredging Machinery, Flour, Powder, Slate and Flint Mill Machinery, Turbine Water Wheels.

York Mfg Co., York, Pa. U. S. A.

Just Half the \$12.50 he world. 44-Cathba factory Price: \$12.50 he world. 44-Cathba factory Price (Lawpion Wires Calappion Vork Mfg Co., York, Pa. U. S. A.

Just Half the \$12.50 he world. 44-Cathba factory Price (Lawpion Wires Cathagung) for the price of the price o Flour, Powder, Slate and Flint Mill Machinery, Tur-bine Water Wheels,



THE Automatie Safety Engine.

and 4 horse power. Always ly. No engineer. No dirt. No e. Cheap, reliable, economical Rochester Machine Tool Works, Rochester, New York

SHIELDS & BROWN



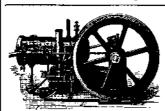
For BOILERS and STEAM PIPES FOR BUILDENS SHU SILEAD IN Reduces Condensation of Steam.
FOR GAS AND WA'TER PIPES.
Prevents Sweating and Freezing.
The Best Non-Conductor of Heat and Cold in the World Send for illustrated descriptive Circular, and name this paper.

143 Worth Street, New York.
78 and 80 Lake Street, Chicago.

BIC OFFER. To introduce them, we self-Operating Washing Machines. If you want one send us your name, P. O. and express office at once. The National Co., 23 Dev St., N.Y.

TREPEATING R

112 Liberty Street, New York.



96 Lake Street, Chicago.

GAS ENGINES.

Best in principle, workmanship, and materials.
An unequaled small Motof adapted to all uses.
When the motor is not at work, the expense of running it ceases.
Simple, Safe. Economical, Durable. No extra insurance.
Four sizes: I H. P., ½ H. P., 1 man power, and Dental Engine.
These Engines are specially suited for Gasoline Gas for country use.

Send for Illustrated Catalogue.

ECONOMIC MOTOR CO., Office and Salesrooms, - 34DEY ST., N. - 34 DHY ST., N. Y.

HYDRAULIC FLANGED HEADS.

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

SCRANTON, PA.

57 Oliver Street, Boston.

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.

ICROSCOPES Telescopes, Spectacles, Barome-graphic Outilis for Amateurs, Open Glasses, &c. W.H.WALMSLEY & CO. successors to R. &J. Beck, Philadelphia. Illus. Price List free to any address.





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 six-teen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular resume of the best scientific in-formation of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this fournal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIEN-TIFIC AMERICAN will be sent for one year—52 numbers— postage prepaid, to any subscriber in the United States or Canads, on receipt of three dollars by the publishers; six months, \$1.50; three months, \$1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERI-

OAN will be supplied gratis for every club of five subscribers at \$3.00 each; additional copies at same proportionate

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. Address all letters and make all orders, drafts, etc., pay-

MUNN & CO., 361 Broadway, New York.

Scientific American Supplement.

This is a separate and distinct publication from Pho 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 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, Geclogy, Mineralogy, Natural History, Geography, Archæology, 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 and valuable information pertaining to these and allied subjects is given, the whole profusely illustrated with engravings.

The most important Engineering Works, Mechanisms Manufactures at home and abroad are represent 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 AM-BRICAN and one copy of the SUPPLEMENT, both mailed for one year for \$7.00. Address and remit by postal order, express money 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 or express money 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.,