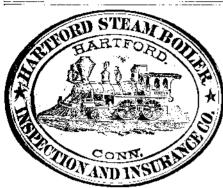
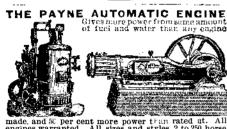
### Sidvertisements.

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

(About eight words to a line.)

bngravings may head advertisements at the same rate per line, by measurerrant, as the letter press. Adver-tisements must be received at mubit aton office as early as Thursday morning to uppear in next issue.





made, and \$\mathbb{S}\$ per cent more power trun rated at. All engines warranted. All sizes and styles, 2 to 250 horse power. Send for prices and catalogue A4.

P. 4. B. W. PAYNE & SONS.

P. 6. Rox 1207.

Orour General Sales Office, 33 Liberty St. & 149 B'way, N.Y.

THE CARPET BEETLE AND OTHER domestic insectpests. An interesting and instructive paper read by Dr. H. A. Hagen before the Boston Society of Natural History. Giving the complete natural history of the new carpet beetle, where it came from originally, how it has spread, its destructive habits, and how its ravages may be prevented. A description of the Attagenus Megatoma—a new relative of the Carpet beetle, inst as destructive, and which, although not well known to the public, is really equally as common as the latter. The Common Flea and its rapid increase during the last few years. The recent increase in the number of Cat Fleas and the annoyance that they have caused housekeepers in the Eastern States. Fleas in Poland and the remedy against them in that Country. Polish Fleatraps described. The present variety of the Ressian fly and Wheat Midge. Hew insects, like plants, are introduced into and distributed through New Countries. The home of the Cockroach, and the insect's immigration westward. The introduction of plants and insects by emigrants, and the gradual change of a country's insect fauna by a change of its flora. Butterflies that have made the trip around the world. Insects constantly brought from Europe by steamers; the grain weevil, the rice weevil, and the asparagus beetle. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 161. Price 10 cents. To be had at this office, and of all newsdealers THE CARPET BEETLE AND OTHER

# BRICK THE AND CLAY RETORTS ALL SHAPES BORGNER & O'BRIEN .



STEEL BALLS BEARINGS.

From 3-16 in. to 3-4 in. diameter. Hardened and Polished, and gauged to 1-2000 of an inch.

,Weed Sewing Machine Co., Hartford, Ct.

THE ART OF LEATHER MANUFAC-ture. By A. Watt. Being a Practical Handbook in which the Operations of Taming Corrying, and Jealier Dress-ing are fully beserved, the Principles of Taming Ex-plained, and many recent Processes Introduced, as also Methods for the Estimation of Tamin, and a Description of the Arts of Glue Religing, Get Dressing, etc. With il-lustrations. 12mo, cloth. Landon, 1884. Price \$5. Sent, postage prepaid, by MUNN & CO., New York, on receip-of-price. THE ART OF LEATHER MANUFAC-

# H.M. JOHNZ,

Roofing, Building Felt. Steam Packings, Boiler Coverings, Fire Proof Paints, Cements, Etc. Samples and Descriptive Price Lists Free. H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y. 175 Randolph St., Chicago; 170 N. 4th St., Philadelphia.

PETROLEUM AS FUEL IN LOCOMO the Englines. A paper by Thomas Urquhart.—Howloco-motives are arranged for burning petroleum. The spray injector. Storage of petroleum. Experimental engines and tenders. Results of comparative trials. Contained in SCIENTIFIC AMERICAN SUPPLEMENT NO. 455. Price 10 cents. To be had at this office and all newsdealers.

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 unequeled fucilities 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, Reissnes, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and romptness, on very reasonable terms.

taining full information about l'atents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Pa-

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.

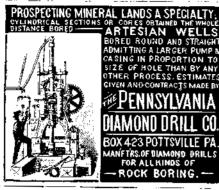
## Aluminum Bronze, Aluminum Silver, Aluminum Brass,

SILICON BRONZE,

FURNISHED IN INGOTS, CASTINGS, RODS, OR WIRE.

Our Malleable Castings can be made of over 100,000 pounds tensile strength, with extraordinary power to with-and corrosive influences, and unrivaled beauty of color. Send for pamphlet.

THE COWLES ELECTRIC SMELTING AND ALUMINUM CO., CLEVELAND, O.

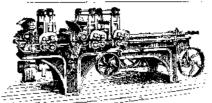


ELECTRICAL Supplies of every description.
Telegraph Instruments, Battertes, Wire, Magnets, Electric Bells, Annunciators,
and Burgular Alarms. Supplies for Electro-platers
and Experimenters, Electro-Medical Apparatus, etc. ad Experimenters, Electro-Medicai Apparatus, etc. end for illustrated catalogues. ARTRICK & CARTER, No. 114 So. 2d St., Phila.

APPARATUS FOR ELECTRICAL MEAS APPARATUS FOR ELECTRICAL MEAS urements.—Illustrations and description of the various interesting apparatus for measuring electricity that were shown at the Munich Exhibition, including Wiedemann's bifilar galvanometer; Wiedemann's galvanometer for strong currents; Zenger's differential photometer; Von Beetz's solenoid; apparatus for demonstrating the principle of the Gramme machine; Van Rysselberghe's thermometrograph; Von Beetz's chronograph; and Harlacher's apparatus for studying deep currents. Illustrated with seventeen engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 421. Price 10 cents. To be had at this office and from all newsdeelers.

VVM. A. HARRIS,
Providence, R. I. (Park St.), Sixminutes' walk Westfromstation
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.

EMERALD GREEN.—A PAPER BY R. Galloway, M.R.I.A., describing the method of manufacture of this pigment, and discussing its poisonous and other properties. Contained in SCIENTIFIC AMERICAN SUPPLEMENT NO. 455. 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 R. Bail & Co., Worcester, Mass. Send for Catalogue.

HOW TO COLOR LANTERN TRANSPA rencies.—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. 423. Price 10 cents. To be had at this office and from all newscealers. The same number contains an illustrated paper on Improvements in Photo-block rinting.—Another valuable paper on the Preparation on Lantern Transparencies is contained in SUPPEMENT, No. 424.



OSITIVE BLAST IRON REVOLVERS, PERFECTLY BALANCED, Has Fewer Parts than any other Blower.

P. H. & F. M. ROOTS, Manufacturers,

CONNERSVILLE, IND.

S. S. TOWNSEND, Gen. Agt., 22 Cortland Street, COOKER & CO., Selling Agts., 22 Cortland Street, IVAS. BEGGS & CO., Selling Agts. 9 Dey Street, NEW YORK.

SEND FOR PRICED CATALOGUE.

cues and Art of the Manufacture of Portland Cement, with observations on some of its constructive applications. By Henry Reid, C.E., anthor of "A Practical Treatise on Concrete," etc. Svo, cloth. Price \$7.25. Address MINN & Co., 381 Broadway, New York.

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.,

Sondfar Price List "A." 79 Kilby Street, Boston.

71 John Street, New York. WORK SHOPS WITHOUT STEAM POWER BY USING OUTFUS OF

Barnes Patent Foot machinery can compete with steaming power. Rold on trinit. Metal and weodworkers sent for prices. Lassitated earlogate troc.

W. F. & Juo. Barnes Co.

Rockford, Ill. Address No. 1999 Main St.

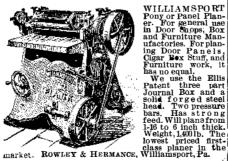
HEAD ROUNDING

BARREL, KEG, HOGSHEAD,  $\Delta ND$ 

Stave Machinery. Over 50 varieties

E. & B. HOLMES Buffalo, N. Y.

By Prof. T. G. Wolmley. Including their Physiological, Path ological, and Legal Relations, with an Appendix on the Detection and Microscopic Discrimination of the Blood. A new edition, revised and enlarged, two, cloth, with plates. 1885. Price \$7.50. Scut, postage prepaid, on receipt of price by Munn & Co., New York. MICRO-CHEMISTRY POISONS.  $\mathbf{OF}$ 



WILLIAMSPORT
Pony or Panel Planer. For general use
in Door Snops, Box
and Furniture Manufactories. For planing Door Panels,
Gigar Exe Stuff, and
Furniture work, it
has no equal.
We use the Ellis
Patent three part
Journal Box and a
solid for ged steel
head. Two pressure
bars. Has strong

AUSTRALIA. American Manufactur wishing to be represented in these colonies please municate with Messrs. Imray & Co., Australian Ag. 28a Basinghall St., London, E. C., and at Sydney Melbourne.

A pampilet sent free of charge, on application, con ENGINEER'S POCKET BOOK. Charles II. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Maxorry, Steam Vessel, Mills, Limes, Mortars, Cements, etc. 901 pares, leather, pocket-book form. Price \$4. This valuable work will be sent on receipt of price by MUNN & CO., New York.

THE CORINTH CANAL.—A DESCRIPtion of the project of Mr. B. Gerster, engineer in chief of the International Corinth Canal Company, and a sketch of the progress frus far accomplished. Nature of the Isthmus of Corinth. Former undertakings. Route selected by Mr. Gerster. Mode of excavating. Apparatus employed. Illustrated with 6 engravings. Contained in Scientific American Supplement. No. 425. Price 10 cents. To be had at this office and from all newsdealers.



maker's and Iron Ship-builder's Companion, comprising a series of original and carefully calculated tables, of the utmost utility to persons interested in the iron trades. By JAMES FODDEN, author of "Mechanical Tables," etc. \$2.00. Address MUNN & Co., 351 Broadway, N. Y. City. Send for our special book catalogue, to be had free on application.

SAWS Wanted MONO Sawyers and SAW S full address for a copy of Emerson's EF Book of SAWS. We are first to introduce NATURAL GAS for heating and tempering Saws With wonderful effect upon improving their W quality and toughness, enabling us to reduce W prices Address. prices. Address EMERSON, SMITH & CO. (Ltd.), Beaver Falls, Pa.

GLASS PAINTING. BY FRED MIL-ler. A Course of Instruction in the Various Methods of Painting Glass and the Principles of Design. Illus-trated, 12mo, cloth. London, 1885. Price \$2.00. This valu-able book sent by mail prepaid by MUNN & Co., New York, on receipt of price.



BOOKWALTER ENGINE. 

PERSPECTIVE

AICHITECTURAL for Beginners with for Beginners, with 11 pairs of Practical Examples, Quarto, cloth. By F. A. Wright. This book will be sent to any address, postage prepaid, on receipt of price by MUNN & Co., New York. Price \$2.50.



HARRISON CONVEYOR!

Handling Grain, Coal, Sand, Clay, Fan Bark, Cinders, Ores, Seeds, &c. Send for BORDEN, SELLECK & CO., { Sole Manufers,} Chicago, III.

Beaudry's Upright
Power
Hammer.

The simple construction of this Kammer, with its steel-arms, and elastic blow, makes it the most efficient and blow, makes it the most efficient and open class. Send for circulars and price list.

BEAUDRY & CUNNINGHAM, 70 Kilby St., Boston, Mass.

Address JOHN A. ROEBLING'S SONS, Manufacturs, Trenton, N. J., or 117 Liberty Street, New York: Wheels and Rope for conveying power long distances.

# 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.



Branch Bouses: 12 Watten Street, New York. 115 Wabash Avenue, Chicago, 111.

## The Scientific American.

THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

Published Weekly, \$3,20 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 Manufac-tures. 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 bave a place in every Dwelling, Shop, Office, School, or Idbrary. Work-

men, Foremen, Engineers, Superintendents, Directors, Presidents, Officials, Merchants, Farmers, Teachers, Løwyers, 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, \$8.20 a year; \$160 six months. Specimen; copies, free, Remit by

\$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 AMrate 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 revery wide range of contents. cent papers by eminent writers in all the principal de-partments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light Heat, Mechanical Engineering, Steam and Rail-Light. Heat, we change I Engineering, Steam and Ran-way Engineering, Mining, Ship Building, Marine En-gineering, Photography, Techhnology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horti-culture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information per-taining 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 AM ERICAN and one copy of the SUPPLEMENT, both mailed for one year for \$7.00. Address and remit by postal

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, Austral, 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 wiff CHAS.
ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sta. Phila., and 47 Rose St., opp. Duane St., N. X