Advertisements.

Inside Page, each insertion - - - 25 cents a line. Back Page, each insertion - - - \$1.00 n 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 received at publication office as early as Thursday morning to appear in ne tissue.



These Hack Saws will cut Iron and Steel be

These Hack Saws will cut Iron and Steel be yond all expectation.

Iron working mechanics everywhere must and will use them. They do the work of files at one-tenth the cost, and in one-tenth the time. One Patent Nickel-plated Steel frame, and one dozen 8 inch Blades, sent by mail, prepaid, on receipt of \$1.50. Hardware dealers will furnish them at at the same price. All saws marked with a star, and bearing our name are fully warranted.

MILLERS FALLS CO..

MILLERS FALLS CO., 93 Reade Street, New York



ICE-HOUSE AND REFRIGERATOR Directions and Dimensions for construction, with one illustration of cold house for preserving fruit from season to season. The air is kept dry and pure throughout the year at a temperature of from 34 to 36. Contained in SCIENTIFIC AMERICAN SUPPLEMENT NO. 116.

Price 10 gents. To be had at this office and of all news-

New Gas Engine "The Baldwin"

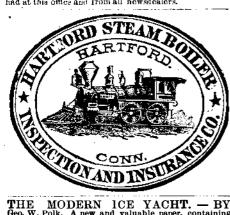
Exhibited at the late American Institute Fair, New York.

A four horse-power engine in connection with storage battery, running 84 incandescent electric lights (and without battery, 82 lights), giving a perfect light, with all the steadiness that can be obtained from the high-speed steam engines in common use for electric lighting, and permitting any number of lights to be shit off or turned on without affecting the remaining lights in the slightest degree. A marvel of beauty, perfection, and power, adapted to lighting, pumping, and all purposes where a safe and cheap power is required. Manufactured and guaranteed by

Otis Brothers & Co.,

Elevators and Hoisting Machinery, 38 PARK ROW, NEW YORK.

RESERVOIR DAMS.-A PAPER BY David Gravell, describing the prominent features of the typical masonry and earth work dams of the world. With Zalibstrations. Contained in Schenger American Superinger American Superinger American Superinger and from all newscealers.



THE MODERN ICE YACHT. — BY Geo. W. Polk. A new and valuable paper, containing full practical directions and specifications for the construction of the fastest and best kinds of Ice Yachts of the latest, most approved forms. Illustrated with engravings drawn to scale, showing the form, position, and arrangement of all the parts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 624. Price 10 cents. To be had at this office and of all newsdealers.



PANAMA CANAL.—A PAPER BY DR.
W. Nelson on some of the difficulties to be overcome in the prosecution of this work. Damming the Chagres River. Extent of the earth cutting. Ocean tides. The climate. Prevalent diseases. Cost of the canal in lives. Cost of the work. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 613. Price 10 cents. To be had at this office and from 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.

for inventors.

In this line of business they have had forty-on-wars 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. Measure Muni, & Co. also attend to the preparation of Caveats. Copyrights for Books, Labels, Reissues. Assignments, and Reports on Intrinsements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

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, Assignments, Rejected Cases, Hints on the Sale of Patents, Rejected Cases, Re

We also send. Ires 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,



The Original Unvolcanized Packing

CALLED THE STANDARD—As it is the Packing by which all others are compared.

Accept no packing as JENKINS PACKING unless stamped with our "Trade Mark."

JENKINS BROS. 12 John Street, N. Y. 105 Milk Street, Boston. 18 So. Fourth St., Phila. 54 Dearborn St., Chicago.

Barnes' Patent Foot Power Machinery. 🚮 WORKERS OF WOOD OR METAL, tout steam power, by using outsits of these Machine bid lower, and save more money from probe, than by any other means for doing rowrk. Also for

their work. Also for Industrial Schools or Home Training, With them boys can acquire practical jour-neymen's trades before they "go for them-selves." Price-List Catalogue Free. W. F. & JOHN BARNES CO., No. 1999 ... Buby St., Bookford, IIL

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUP-PLEMENT, 59. Price 10 cents. To be had at this office and of all newsdealers.

H.W. JOHNS

Asbestos Roofing, Building Felt, Steam Packings, Boiler Coverin Fire Proof Paints, Cements, Etc. Samples and Descriptive Price Lists Fre H. W. JOHNS MF'G CO., 87 MAIDEN LANE, N. Y.





SEVERN AND MERSEY TUNNELS.— Full description of these two important engineering works, with two engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 604. Price 10 cents. To be had at this office and from all newsdealers.



Mention this paper.

VELOCITY OF ICE BOATS. A COLLEC-tion of interesting letters to the editor of the SCIENTIFIC AMERICAN on the question of the speed of fee boats, de-monstrating how and why it is that these craft sail faster than the wind which propers them. Hustrated with 10 explanatory diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 214. Pice 10 cents. To be had at this office and from all newsdealers.





Star"
Foot Lathe
Swings
9x25 (n. LATHE

DRY AIR REFRIGERATING MACHINE Description of Hall's improved horizontal dryair refrigerator, designed to deliver about 10.000 cubic feet of cold air per hour, when running at a speed of 100 revolutions per minute, and capable of reducing the temperature of 30° above to 30° below zero. With five figures showing plan and side elevation of the apparatus, and diagrams illustrative of its performance. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 288. Price 10 cents. To be had at this office and from all newsdealers.

SAWS Wanted 50,000 Sawyers and SAW S Lumbermen to send us their SAW S full address for a copy of Emerson's 25 Book of SAWS. We are first to introduce NATUR-AL GAS for heating and lempering Saws Awith wonderful effect upon improving their W quality and toughne, enabling us to reduce W prices. Address SMITH & CO. (Ltd.), Benver Falls, Pa. S

Address JOHN A. ROEBLING'S SONS, Manufactur-rs, Trenton, N. J., or 117 Liberty Street, New York. Wheels and Rope for conveying power long distances. end for circular.



Patent Riveted Monarch Rubber Belting BEST IN THE WORLD.

Specially adapted for PAPER MILLS, SAW MILLS, and wherever a BELT of UNUSUAL STRENGTH is required.

THE GUTTA PERCHA AND RUBBER MFG. CO. New York, Chicago, San Francisco.

ESTABLISHED HALF A CENTURY.



HAVE MANY ENTED PATENIMPROYEMENTS OTHER MAKES THAT WILL WELL REPAY AN INVESTIGATION BY THOSE WHO TO SECURE THE BEST SAFE MARVIN SAFE CO.

NEW YORK, PHILADELPHIA,



USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers. Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed

MUNN & CO., 361 Broadway, New York.

ASK YOUR STATIONER FOR THE JOHANN FABER LEAD PENCILS THE BEST NOW MADE

JAMES B. EADS.—AN ACCOUNT OF the life and labors of this eminent engineer. With a portrait. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 592. Price 10 cents. To be had at this office and from all newsdealers.

Steam! Steam!

We build Automatic Engines from 2 to 200 H. P., equal to anything in market.

A Large Lot of 2, 3 and 4-H. Engines With or without boilers, low for cash,

B. W. PAYNE & SONS,

Elmira, N. Y. Box 15,



SUPERIOR Stationary Engines

with Plain and Automa-tic Cut-off. Vertical and



361 Broadway, New York.

BRAI'CH OFFICES.—No. 622 and 624 F Street, Pa- | Shafting and Gearing, Textile Machinery, | Colif Building, near 7th Street, Washington, D. C. THOS. WOOD & CO. 22d and Wood Sts., Philadelphia, Pa.

We are prepared to furnish the finest quality of WORK, for the manufacture of which we have unequalied facilities. Henry Dission & Suns, Incorporated, Jobbing Department, Front & Laurel Sts., Phila. Pa.

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.

AUTOMATIC CUT OFF ENGINES PERFECTLY MANUFACTURED UPON SCIENTIFIC AND PRACTICAL PRINCIPLE BALL ENGINE CO. ERIE PA.

HYPNOTISM IN FRANCE. - AN INteresting review of the present status of this subject, by Max Dessoir. Contained in SCIENTIFIC AMERICAN SUP-PLEMENT, NO. 613. Price 10 cents. To be had at this office and from all newsdealers.

THE

<u>Scientific American</u>

ESTABLISHED 1846.

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 si een pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Noveltles in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

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 Canada, on receipt of three dollars by the pub-lishers; six months, \$1.50; three months, \$1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars. 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., payable to

MUNN & CO., 361 Broadway, New York. THE

Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions.

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 all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geokraphy, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ripi Building, Marine Engineering, Photography, Jechnelogy, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Riography, Medicine, etc. A vast amount of fresh my, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms. and Manufactures at home and abroad are illustrated 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. Single copies 10 cents. Address and remit by postal order, express money order, or check

MUNN & Co., 361 Broadway, N. Y., Publishers Scientific American.

Builders Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors, and with other fine engravings: illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Draw perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc. The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any

Architectural publication in the world. Sold by all newsdealers. \$2.50 a year. Remitto MUNN & CO., Publishers, 361 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS ENEU JOHNSON & CO.'S INK. Tenth and Lom-bard Sts., Phila., and 47 Rose St., opp, Duane St., N. Y.