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 received at Publication office as early as Thursday morning to appear in the following week's issue.



COMPTOMETER

ALL ARITHMETICAL PROBLEMS
Solved rapidly and accurately by using the Comprometer. Saves 40 per cent. of time. Entire relief from mental strain. Adapted to all commercial and scientific computations. Send for circular.

FELT & TARRANT MFG. CO., 52-56 Illinois St., Chicago.

ARTIFICIAL INCUBATION.—A DEscription of the French process of raising chickens. With 7 figures. Company in SCRETTIFIC AMERICAN SUPPLEMENT, No. 775. Price flocents. To be had at this office and from all news dealers.

MACHINE TOOL Engine Lathes, Planers, Shapers, Turret Lathes, etc. Send for Catalogue. The Hendey Mach. Co., Torrington, Conn.

LEARN WATCH MAKING, Engraving, and kindred branches. Stud for Prospectus. CHICAGO WATCH-MAKERS' INSTITUTE, 22 Van Buren Street, CHICAGO.

PLATINUM. PLATINUM WIRE, CRUCIBLES, DISHE-etc., and Refiner of Platinum, Gold, and Silver. Ham-mered work a specialty. Old ware remade and scrap bought. MALVERN PLATINUM WORKS, MALVERN PA, JOHN C. ENTRIKEN, Proprietor.

Harvest Excursions At LOW RATES via Missouri Pacific Ry.

and Iron Mountain Route. To Missouri, Kansas, Arkansas, Texas and all points West and Southwest. Aug. 25, Sept. 15 and 29. Good for 30 days, with stop-over privileges.

H. C. TOWNSEND, G. P. A., St. Louis, Mo. 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 Lee Yachts of the latest, must 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 ceuts. To be had at this office and of all newsdealers.

MANUFACTURERS

SIXTIETH GRAND NATIONAL INDUSTRIAL EXHIBITION ●F THE

American Institute of the City of New York Will open September 30 and close November 28, 1891. Intending exhibitors must make early application to secure proper space and classification. For blanks and other information, address CHARLES WAGER HULL, General Superintendent, American Institute, 113 West 33th Street, New York City.

COLORING MATTERS: THE QUANtitative estination of by means of their absorption spectre. By T. L. Patterson, F.L.C., F.C., N. With a ligner, Co-tain-prin Scientific American Structure of the Co-tain-prin Scientific American Structure of the Co-tain-principle of the Co-tain-

H.W.JOHNS ASBESTOS STEAM PACKING

Boiler Coverings, Millboard, Roofing, Building Felt, Liquid Paints, Etc. DESCRIPTIVE PRICE LIST AND SAMPLES SENT FREE. H. W. JOHNS MFG. CO., 87 Maiden Lane, N.Y.

PELTON WATER WHEEL



Gives the highest efficiency of any wheel in the world.
Simple and reliable, adapted to every variety of service, with heads of 20 feet and upward. Write for circulars.

The Pelton Water Wheel Co.

12la Main St., San Francisco, Cal. or 22nd Central Failding, Liberty and West Streets, New York.

MILITARY SIGNALING.—THE EARLY history of Semaphoric Telegraphy and the modern practice of it in the American Army. With 17 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. Nos. 781 and 782. Price 10 cents each. 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.

In this line of business they have had forty-five wears' experience, and now have unequaled facilities for the preparation of Patent Drawings, Specifications, and the preparation of Applications for Latents 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 pampliet 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 Patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,

MUNN & CO., Solicitors of Patents. 361 Broadway, New York.
BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.



Densmore Type Writer is nowready, and should be examined before purchasing any other.

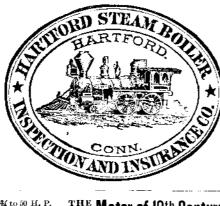
MANY IMPROVEMENTS. HIGHEST STANDARD.

Invented, owned, and controlled by men baving had fifteen years' experience on type-bar machines.

Simplicity, Strength, Durability, High Speed, Lusy Action, Permanent Alignment, Most Convenient, Two Interchangeatile Captinges, Steel Throughout, STANDARD KEY-BOARD, with shift carriage for capitals. For Call or send for catalogues.

We will appoint a reliable dealer in all cities as soon as possible, and in the meantime will ship machines on approval to parties having a good commercial rating. DENSMORE TYPE WILLIAM DR. 2022 Page durer. N. V. DENSMORE TYPEWRITER CO., 202 Broadway, N. Y.

"The best of all typewriters; the height of perfection. To buy any other than the 'Demsnore' is to make a mistake."—C. T. Blumenschein, Stenographer, National Park Bank, New York.



Motor of 19th Century % to 50 H. P. Can be used Any Place, to do Any Work, and by Any One. No Boiler! No Fire! No Steam! No Anses! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. Cost of operation about one cent an hour to each indicated herse power. For circulars, etc., address.

CHARTER GAS ENGINE CO. P. O. Box 148, Sterling, Ill.



THE HANDY

bulse etc., heins simple, hurse compact, hetter autient our tie purpose an il much cower in price than wheel-handled straightway valves, is rapidly supersedine these to be supersed to be supersed by the sup

NEW KODAKS



ALL LOADED WITH **Transparent** Films.

Styles and

THE EASTMAN COMPANY, ROCHESTER, N. Y Send for Catalogue.



DEVELOPMENT OF AMERICAN ast Furnaces, with special reference to large Yields.— James Layley. A description of some of the princi-lalast furnaces in the United States, showing the larges in design and practice by means of which exanges in design and practices, contained in the last cordinarily arge yields have been obtained in Schentific attendant Strick String in the last contained in Schentific attendant Strick Strick Indianal Industrial Contained in Schentific To had at this office and from all newsdealers.



SIEMENS'*CABI

SUBMARINE, TELEGRAPH, UNDERGROUND, TELEPHONE, INTERIOR, ELECTRIC LIGHT.

Manufactured under authority of

SIEMENS & HALSKE by THE EDISON GENERAL ELECTRIC CO. at their SCHENECTADY WORKS

Estimates furnished on application

Cable and Wire Department, Edison General Electric Company,

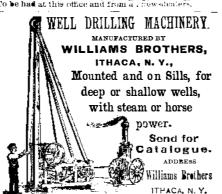
JAMES WATT, AND THE APPLICAtion of Science to the Mechanical Arts.—By Archibald Barr, B.Sc. A very interesting review of the life work of the celebrated engineer, with the lessons to be drawn from it by those who are entering upon the study of work. Contained in Scientific Anthropy work. Contained in Scientific Anthropy Scientific Anthropy MENT, No. 744. Price 10 cents. To be had at this office and from all news dealers.



Minerals & Scientific Books

The largest stock in the world. Complete pieces of the Meteoric Iron from Canon Dablo, described in this paper Aug. 23. 50 cts. and upward. Send for catalogue, specifying in what branch of science you are interested. A. E. FOOTE, 4116 Elm Ave.,

Philadelphia, Pa. POROUS EARTHENWARE. - BY Chas. C. Gilman. An elaborate discussion of terra cotta lumber and its future uses. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 804. Price 10 cents. To be had at this office and from a . newsdealers.





POPE MFG. CO., 77 Franklin Street, BOSTON. Branch Houses: 12 Warren St., NEW YORK, 291 Wabash Ave., CHICAGO. Factory, HARTFORD, CONN.

OILS AND FATS—SOME PRACTICAL

HANGERS AND COUPLINGS

COMPLETE STOCK OF

Double Brace, Self-Oiling, Adjustable Ball and Socket Hangers, Pillow Blocks, Post Hangers, Etc.

Edison Patent Compression Coupling.

EDISON GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

Manufactured by HARRISBURG FOUNDRY AND MACHINE WORKS, Harrisburg, Pa., U. S. A. STEAM ROAD



STATIONARY AND MARINE.
Petroleum, Kerosene Oil, and Natural Gas Fuel.
1, 2, 4, 6, and 8 Horse Power, Single.

S and 22 Horse Power, Compound For Elevating Water, Creameries, and all Manufacturing Purposes. SHIPMAN ENGINE CO. 210 Summer - St BOSTON.

PASSON VISION ELEVATORS

THE AMERICAN BELL TELEPHÔNE CO.

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.

SAWS Wanted 20(10) Sawyers SAWS and Learn Detends to SAWS send us their full address for a copy of Emerson's 127 Book of SAWS, new 1890 edition. We are first to introduce NATURAL A GAS for heating and tempering Saws with Wonderful effect upon improving their quality and toughness, enabling us to reduce prices. Address EMERSON, SMITH SCOOK, Climited), Beaver Falls, Pa. S

THE

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 sixteen 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. 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, Canada, or Mexico, on receipt of three dollars by the publishers; 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 Useful Arts, embracing Biology, Geology, 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 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, New York, Publishers SCIENTIFIC AMERICAN.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND 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. Drawings in 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. Remit to

> MUNN & CO., Publishers, 361 Broadway, New York.

PRINTING INKS

The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York