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 next issue.

COMPLIMENTS A TANITE CO.

Twenty years ago the advertisements of The Tanke Co., of Stroukburg, Pu., appeared weekly in these columns, and the push and enterprise of that Company soon stirred up an active interest in the economy of grinding processes and built up a new industry. To the pioneer work of the Tanite Co. is due the extension of this industry in all parts of the world and the increased demand for Solid Emery Wheels and Grinding Machines. Thus far the mechanical public has associated the Company's name only with these goods. The time has arrived when the Company's name is to be associated with another industry of equal importance. After many years' experience with Emery bought of all the Foreign and American makers, it began the manufacture of Emery for its own use. In this it succeeded so well that in March, 1850, it issued circulars offering Tanite Mills Emery to the public. The demand has grown rapidly and The Tanite Co. is now handling as much Emery as any concern in the world. Users who heretofore have only bought brands bearing some well known trade mark, or distinguished by some special shape or color, will do well to make a trial of Tanite Mills Emery. Afterusing Emery for 12 years, and building up a world-wide reputation for its Tanite Wheels, it is not likely that the Company wouldoffer Emeryunder its own name unlessit was assured that it offered goods of quality equal to any.



varded the Grand Prize at late Paris Exposition

THE COPYING PAD.—HOW TO MAKE and how to use: with an engraving. Practical direction how to prepare the gelatine pad, and also the antimenth by which the copies are made; how to apply the written terror the pad; how to take off copies of the letter to the pad; how to take off copies of the letter to that and the contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO 438. Price He cents. For sale at this office and by all newsdealers in all parts of the country.



OVERMAN WHEEL CO., MAKERS, CHICOPEE FALLS, MASS.
ISTON. WASHINGTON. DENVER SAN FRANCISCO.

A. G. SPALDING & BROS. FRANCISCO.

SPECIAL AGENTS, NEW YORK. PRILADELPHIA

ATMOSPHERIC DUST.-BY WILLIAM Marcet, F.R.S. An address delivered to the Royal Meteorological Society. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 7.55. Price 10 cents To be had at this office and from all newsdealers.

NEW KODAKS



"You press the button, we do the rest."

> Seven New Styles and Sizes **Transparent**

For sale by all Photo. Stock Dealers.

THE EASTMAN COMPANY.

ROCHESTER, N. Y.

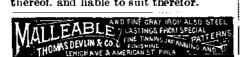


THE AMERICAN BELL TELEPHONE CO.

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.





\$85 Lovell Diamond Safety \$85

eel Drop Forgings, Steel Tubing, Adjustable Ball Bearings to all s, including Pedals. Suspension Saddle. Finest material money can buy. Finished in enamel and nickel.

Strictly high grade in every particular. No better machine made at any price.

Licycle Untutoque Free. Send six cents in stamps for our 100-page illustrated catalogue of Guns. Rifles, Revolvers, Sporting Goods of all kinds, etc.

JOHN P. LOVELL ARMS CO., 147 Washington Street, BOSTON, MASS.

STEREOTYPING.—A VALUABLE series of lectures by Thomas Bolas, discussing the most recent methods in this branch of typogracky. With 23 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NOS. 773 and 774. Price 10 cents each. To be had at this office and from all newsdealers.

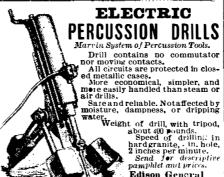


POPE MFG. CO., 77 Franklin Street, BOSTON. Branch Honses: 12 Warren St., NEW YORK, 291 Wabash Ave., CHICAGO. Factory, HARTFORD, CONN.

A LARGE MANUFACTURING CONCERN in Germany wants to manufacture some American articles in the Steel or Iron metal line. Address propositions to KNIFFLER MFG.

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

ARTIFICIAL INCUBATION.—A DEscription of the French process of raising chickens, With 7 figures, Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 77%, Price 10 cents. To be had at this office and from all newsdealers.



Seme pamphlet and praces.

Edison General
Electric Co.
Ruilding, Edison Building, Broad St., New York.

STAMPED CORRUGATED SHEETS

Insure Perfect Joints in Your Buildings. And when your joints are perfect, your buildings are Fire, Wind, and Water Proof.

THE CINCINNATI CORBUGATING CO. Send for Catalogue B. Piqua, Ohio.





After being on the Market Five Years

Sizes One, Two, Three, and Four Horse Power. Arranged for either NATUHAL GAS or Kerosene Oil the, as ordered. No extra insurance required on account of the oil line. Send for catalogue giving full particular and prices.

Actional tie Safe ty Tank. ROCHESTER MACHINE TOOL WORKS, Brown's Race, ROCHESTER, N. Y

WORKING MODELS and Experimental or wood, made to order by Mason & Ration, successors to J. F. Werner, 47 & 49 Centre Street, New York.



Can be used Any Place, to do Any Work, and by Any One. No Boiler! No Steam! No Ashes! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. Cost of operation about one cent an hour to each indicated horse power. For circulars, etc., address

Economy, Reliability, CHARTER GAS ENGINE CO. Simplicity, Safety. P.O. Box 148, Sterling, Ill. KOCH'S DISCOVERIES.—A FULL AC-count of Dr. Koch's remedy for tuber culosis, the method of using it, etc. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. 75'2. Price 10 cents. To be had at this office and from all news-dealers.



Scientific Book Gatalogue

RECENTLY PUBLISHED.

Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application. MUNN & CO., Publishers Scientific American,

JAMES LEFFEL WATER WHEELS ENGINES, and BOILERS.

ÆS LI FARLO ST., SPRINGFIELD, OHIO. 110a Liberty Street New York City.

If you want the SIMPLEST and BEST

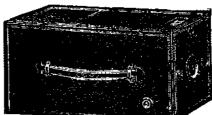
361 Broadway, New Y rk.



for low pressures (below 60 lbs.) whether for Steam, Gas, Water, Oils, or Thick Fluids, investigate the "Handy." It is more compact, and costs much less than any other Gate Valve. Write for Catalogue.

The Lunkenheimer Brass Mfg. Co. 15-17 E. Sth St., Cincinnati, O.

THE PREMIER CAMERA

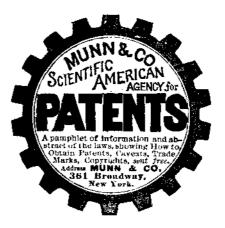


IS THE BEST IN MARKET.

Simple of Manipulation. Plates or Films are used.
The Shutter is always set. PRICE \$18.00.

Send for Catalogue and copy of Modern Photography.

ROCHESTER OPTICAL COMPANY, 14 S. Water St., ROCHESTER. N. Y.



MONEY LOANED AT 2% By Uncle Sam on farms will make mortgages as fashionable as sin is,

The Maker & Gross cullery is hand-forged from razor-sicci,

every blade tested and warranted. Look at knife shown here;

cut is exact size, price is 65.; blades equal any \$2.

razor; price for awhile is \$85.; 6

for \$2, postpaid, Ladies' 2 thate

pearl, \$6.; first steel shears, \$6.

mite shown here and shears, \$6.

most raid.

postpaid. Barber's bollow ground razor \$1.25. Best strop sver made, Sic. Bené for free list. Maber & Grosh, 40 S Street.



SCIENTIFIC AMERICAN SUPPLE-

GRAVES ELEVATORS.

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar lournal now published. It goes into all the Staties and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN. When selecting a list of publications in ward you decide it is for your interest to advertise. This is frequently done, for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

For rates see top of first column of this page, or address MUNN & CO.. Publishers.

361 Kenndway. New York.



New Grade, \$100. CUSHION TIRES and TANGENT SPOKES. Handsomest and Best Diamond Safety.

Send for Catalogue and Second-Hand List.



WM. READ & SONS, 107 Washington St.

THE

Scientific American

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 patent each week.

Terms of Subscription.—One copy of the SCIENTIPET Aurencan will be sent for one near-old numberspostage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of three dollars by the publishers, six months, \$1.00; three months, \$1.00 reliabs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is b Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed all letters and make all orders drafts, etc., pavable to MUNN & CO., 361 Broadway, New York.

MUNN & CO., 361 Broadway, New York.

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 emindut writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæelogy, Astronomy, Chemistry Electreity, Light, Heat, Mechanical Engineering, Science and Bailway Engineering, Mining, Stup Bioling, Marine Engineering, Photography, Technology, Manufacturing Industries, Santiary Engineering, Astroniture, Rorticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Werks, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Pric for the SUPPLEMENT for the United States and Canada, \$5.00 a year: or one copy of the SUPILEMENT, 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 Brondway, New York.

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 cent. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid Magnathe of Architecture, richly adorned with elegant plate; in calors, 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, tagether 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 newsdeaers, \$2.50 a year. Remit to

MUNN & CO., Publishers, 361 Broadway, N w York.

PRINTING INKS