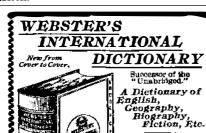
Founded by Mathew Carey, 1785,

HENRY CAREY BAIRD & CO., INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS

ENDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS S10 Walnut St., Philadelphia, Pa., U. S. A.

137 Our new and Revised Catalogue of Practical and Scientific Books. 88 pages. 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

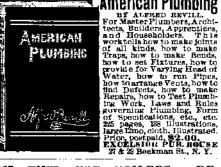


A Grand Educator Abreast of the Times
A Library in Itself Hon. D. J. Brewer

Justice of the U.S. Supreme Court, writes: I commend it to all as The One Great Standard Authority.

Published by
G. & C. MERRIAM CO., SPRINGFIRLD, MASS., U.S.A.
ag-For sale by all Booksellers. Seud to the Publishers for free Prospect ds. Do not buy reprints of ancient editions

🕰 American Plumbing



OIL FUEL FOR BOILERS.— DEscription of the assemblage of the water tube, oll-fired boilers, which supplied the motive power for the Chicago Exposition, and which were the greatest in number and operating power ever before collected in one locality. With 2 illustrations. Contained in Scientific American Supplement, No. 937. Price 10 cents. To be had at this office and from all newsdealers.



BELL TELEPHONES Receivers, Transmitters, Bells, Wire, and all supplies for complete equipment of Telephone and Traigraph lines. Send for descripting prior list, also Telegraph Manual and Catalogue FREE. J. H. BUNNELL & CO., 76 CORTLANDT STREET, NEW YORK.



VANDUZEN STEAM PUMP
THE BEST IN THE WORLD.
Pumps Best in The World.
Always in Order, never Glogs nor
freezes. Every Pump Guaranteed.

200 to 12000 Gallons per Hour. Cost \$7 to \$75 each. Address THE VANDUZEN & TIFT CO.,

ELECTRICAL SUPPLIES at low prices. Send for price list. SOUTHERN ENG! NEERING CO., Manuf'g Electricians, Louisville, Ky.

THE COPYING PAD.-HOW TO MAKE and how to use; with an engraving. Practical directions how to prepare the gelatine pad, and also the smiline ink by which the copies are made, how to apply the written letter to the pad, how to take off copies of the letter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO.

The Most Useful Tool in any Shop is the
RIVETT LATHE
MADE BY
FANEUR WATCH TOOL CO.
BERGHTON,
BOSTON. MASS., U. S. A.
Anybody interested, write
for particulars.
The Highest Award at the World's Columbian Exposition.

JUST PUBLISHED.



\mathbf{m}_{α}

By Richard A. Proctor, F.R.A.S.

A series of twelve elegantly printed Maps of the Heavens, one for every month in the year. Specially prepared for use in North America. With descriptions accompanying each map, giving the names of the prin-

cipal stars and constellations, showing their relative positions at given hours and days of the month. A most beautiful and convenient work, specially adapted for the use of those who desire to acquire

a general knowledge of the starry realms.

arious stars and constellations by Alfred E. Beach.
Altogether this is one of the most popular, useful

and valuable works of the kind ever published.

One quarto volume, elegantly bound in cloth. Price **\$2.50**, postpaid.

MUNN & CO., Publishers, 361 Broadway, New York * THE "MUNSON" TYPEWRITER. *

ine is an "evolution," the outgrowth of years of experier results of scientific work. Its principles appeal at once to educated mechanic. It is Light, small, Compact, Ensily operated, with Universal Key Board.

INTERCHANGEABLE STEEL TYPE WHEEL, durable and easily kept inorder, 30 keys, 90 characters. Weight, with carry-case, 16 pounds. Special wheels for different languages. Highest Medal Awarded, World's Fair, Chicago, 1893. Send for circular to The Munson Typewriter Co., 162 S. La Salle Street, Chicago. III., U. S. A.

BREAD MAKING. — AN ESSAY BY W. T. Callard, read at the annual examination in bread making, held by the National Association of British Master Bakers and Confectioners. A paper of value to bakers as well as to housekeepers. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 949. Price 10 cents. To be had at this office and from all newsdealers.

DEAFNESS



and HEAD NOISES relieved by using Wilson's Common Sense Ear Drums Wilson's Common Sense Ear Drums
New scientific invention, entirely different
in construction from all other devices. Assist the deaf when all other devices fail,
and where medical skill has given no relief.
They are safe, comfortable, and invisible,
have no wire or string attachment. Write
for pamphlet. ** Mention this paper.
WILSON EAR DRUM MFG. CO.,
LOUISVILLE, KY.

SCIENTIFIC AMERICAN DYNAMO. Description of a plain shunt-wound dynamo of simple construction, capable of supplying a current of from 60 to 75 110-voit incandescent lamps, or of being used as a 5 h. p motor. This machine was constructed especially for the benefit of the readers of the Scientific American, by Mr. W. S. Bishop, of New Haven, Conn. It is designed to meet the wants of mechanics and amateurs who desire to construct a simple dynamo for their own use, but who do not care to enter into the subject scientifically. With 24 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. S65. Price 10 cents. To be had at this office and from all newsdealers.

AMERICAN WATCHES.



These cuts represent two wonderful American Products, Waterbury is outdone, as these Waterbare keep perfect time, will last as long as any Watch, are easily repaired, wind quickly and are the Cheapest is the WORLD. Not French, German or Swiss, but AERNEAN. Signed GUARATTEE of Accuracy stc. with each, covering OKE Take. We are responsible, and our Watches are backed by \$3,000,000 Take. Boo,000 Watches sold to date; Present sales over 1,000 daily. DESCRIPTION-American Lever Movement, Quick Train, 2+ Plate, Regular 18 size, Plain or Engraved Case, Soild Gilt or Nickel, Roman or Arabid Dail. Regular Stem Wind, \$2.00 post-paid; 3 for \$5.00. Inside Stem Wind \$1.50 post-paid; 3 for \$4.00. Entire Satisaction Guaranteed. Handsome Chain included ifyou mention paper. INGERSOIL & SRG., G5 GORTLANGTST., M. Y. CITY

MESSIS. MUNN & Co., Solicitors of Patents, have had nearly fifty years' continuous experience. Any one may quickly ascertain, free, whether an invention probably is patentable by writing to Munn & Co. Communications strictly confidential. A bandhout of neteries and

in. This splendid weekly paper, spatily llustrated, has the largest rulation of any scientific work. a year. Specimen copies free. Address MUNN & CO., New, York, 36f Broadway.

FOR \$10.00

FOR \$10.00

Frock or Sack Suit of Strictly All Wool Serge equal to any local tailor's \$18.00 suit for \$10.00 Express charges prepaid. Other Suit just as cheap. We save 50 per cent by buying big lots of material from makers—that accounts for it. Send for samples of cloth and full particulars—free.

LOUIS VEHON. Tailor. X 103 Adams \$1.00 is Sender.

ull particulars—free. LOUIS VEHON, Tailor, X 103 Adams St., Chicago.

RAILWAY & STEAM FITTERS SUPPLIES

Rue's Little Giant Injector. Screw Jacks, Portable Forges & Blowers.

JOHN S. UROUHART, 46 Cortlandt St., N. V.

FIREPROOF FLOORING.—DESCRIPtion of the various systems of fireproof finering employed in Europe and the United States. With 73 illustrations. Contained in SCENNTIFIC AMERICAN SUPPLEMENT, NO. 947. Price 10 cents. To be had at this office and from all newsgealers.

Chain 🐬



GATES ROCK & ORE BREAKER Capacity up to 200 tons per hour.



Has produced more ballast, road metal, and broken more ore than all other Breake's combined.
Builders of High Grade Mining Machinery. King-Darragh Concentrator Connersville Blowers.
Send for Catalogues.
CATES IRON WORKS,

CATES IRON WORKS, 50 CSo. Clinton St., Chicago 136 C, Liberty St. N.Y. 237 C. Franklin St., Boston, Mass

LABORATORY OF Dr. L. K. BOHM Electrical and Chemical Expert. Tests and experiments made for Inventors. Incandescent lamp experiments a specialty. 81 Nassau Street, New York



Here you are! A five Ampere-hour Storage Battery in hard rubber cell, anywhere in IV. S. for 50c. Complete Electric Bell Outfits for \$2. Outfit must be sent by express. F. L. Clark & Co., 69 Dearborn St., Chicago, Ill.

VOLNEY W. MASON & CO.

FRICTION PULLEYS, CLUTCHES, and ELEVATORS PROVIDENCE, R. I.



Send for circulars to K. IMHAUSER, 206 Broadway, New York. P. O. Box 2875.

BELTING of Various Styles, ELEVATORS, CONVEYORS, COAL MINING and HANDLING MACHINERY.

The JEFFREY MANUFACTURING CO., COLUMBUS, O. Send for "98" Catalogue "C." Branches: CHICAGO—NEW YORK. Send for "98" Catalogue "C."

WANTED-Some one with capital to patent and introduce a valuable invention on Carpenters' Planes. Will give half interest in patent. For particulars, address W. E. Williams, Ft. Townsend, Wash. PATENTS for sale of the Vassar Burglar Alarm Seven mechanical and one electrical... The protection

Seven mechanical and one electrical. The protection its efficient, durable, and inexpensive. Testimonials furnished. Address L. A. Fellows, Trustee, Madison, N.J. THE SIMPLEX TYPEWRITER

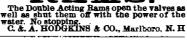


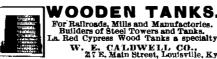
CUARANTEED
to do sa good work
se any high priced
machine. Specially adapted for use
in private cortespondence. Sent
hy mail or express
prepaid on receipt
of \$2.75. In handsom
wainet case, sic. extra Address Simplex Typewriter Co., 26 E. 13th St., New York

Model & Experimental Work, Absolute secrecy. Advice and ideas not charged for. Send for particular GARDAM & SON, 88 John Street, New YORK,

DEAFNESS & HEAD NOISES CURED
by INVISIBLE Tubular Coahlons. Have helped
more to good HEARing than all other devices
combined. Whispers HEARING than all other devices
eyes. F. Hiscox only, 858-8-Bway, N.Y. Hookofproof FREE

RAMS.





Study Electricity at Home by our correspondence method. Terms low. Experiments. Circulars free. Scientific Machin st, Clevel'd, O. EGGS. Best and cheapest food known. Warranted to double egg production. Get circulars. WEBSTER & HANNUM, Cazenovia, N. Y.



To which is added a description of the method of preparing and using artificial luminous stars as an aid in fixing in the mind the names and places of the FINE MACHINERY IRON CASTINGS

TULTON FOUNDRY AND MACHINE WORKS

21 FURMAN STREET (NEAR FULTON FERRY), BROOKLYN, N. Y.

FINE MACHINERY IRON CASTINGS

Tool and Pattern Making, General Machinists, thie, Press, and Interchangeable Work, Plain and Ornamental Japanniug. Sewing Machine Needles (B N W Brand).

Telephone, Brooklyn 1413.

E. B. WILLCOX.

BIT Bores SMOOTH, ROUND, OVAL. and SQUARE HOLES. Mortising Core Boxes, etc. Invaluable to Carpenters, Cabinet and Pattern Makers. Highest Award. Send & 800 for set (% to 11-\$), in neat case, or 50c. for sample Bit, mailed free with Illustrated List.

BRIDGEPORT GUN IMPLEMENT CO., 315 Broadway, New York.

To his own interest, who deals in Arms and Amunutition or who shoots a Rife.
Pass, or Shet Gun and has not a copy of IDRAL HAND BOOK, NA A A
LAND BOOK, NA A A
LAND SHOULD SHOULD SHOOT SHOULD SHOULD

OPKINS' BUILDING DESIGNS. SEND 25 CENTS (Postal Note or silver) for new book of 30 Popular "Plans from "Houses and Cottages." How to build right and economical D. HOPKINS, Archt, Grand Rapids, Mich.

Adjustable Band Fasteners



The Best in the World,
Try them and you will never build
a tank without using this fastener
We make a speciaity of Washington Fir and Lonislana Cypress
Tanks. For circulars and prices
address, mentioning this paper.
The WINSHIP MFG. CO.
Cor State and Huron Streets, RACINE, WIS.

ELECTRO MOTOR, SIMPLE, HOW TO

make. By G. M. Hopkins.—Description of a small electro motor devis ed and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. with 11 figures Contained in SCINNTIFIC AMERICAN SUPPLIMENT. No. 641. Price 10 cents. To be had at this office and from all newsdealers.



BACKUS WATER MOTOR Co., NEWARK. N. J

Parsons Horological Institute. earn the Watch Trade

Engraving and Jewelry Work. PARSONS, IDE & CO. Circular free

302 Bradley Ave., PEORIA, ILL.



HIGH GRADE ONLY. Warranted. Contractors desiring a trustworthy Jack Screw. address Rumsky & Co., Ltd., Seneca Falls, N.Y.

HE LINK-BELT COMPANIES,

PHILADELPHIA. NEW YORK. CHICAGO. Originators of the best practice in the use of Link-Belting of standard designs. or Link-Betting of standard designs.

Ewart Link-Betting (31 regular sizes).

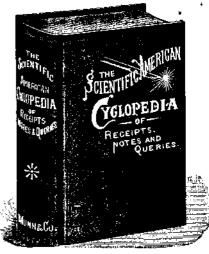
Sprocket Wheels, Rope Transmissions,

Fibre-Graphite Self-Lubricant Journal Bearings.

Machinery for elevating and conveying any material.

Philadelphia address, 2020 Hunting Park Av.

A New and Valuable Book.



12,500 Receipts. 708 Pages. Price \$5.

Bound in Sheep, \$6. Half-Morocco, \$6.50.

This spiendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years: together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arise being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the stud-

The work may be regarded as the product of the stud-ies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions. Send for Descriptive Circular.

MUNN & CO., Publishers, SCIENTIFIC AMERICAN OFFICE, 361 Broadway, New York,