

An Encyclopedia of Useful Technical Knowledge. A great Labor, Time, and Money Saver for Practical Men.

Price \$2.00.

Free of Postage to Any Address in the World.

THE English and American Mechanic.

AN EVERY-DAY HAND-BOOK FOR THE WORK-SHOP AND THE FACTORY.

Containing several thousand Receipts, Rules, and Tables indispensable to the Mechanic, the Artisan and the Manufacturer. By B. Frank Van Cleave. A New, Revised, Enlarged and Improved Edition. Edited by Emory Edwards, M.E., Author of Edwards' 900 Examination Questions and Answers for Engineers and Firemen. Illustrated by 35 engravings. One volume, 630 pages, 12mo, closely printed; the matter covering an extremely wide range of useful technical information for all classes of mechanics and other practical men.

A circular of 24 pages, showing the full Table of Contents of this valuable book, will be sent free and free of postage to any one in any part of the world who will furnish us with his address.

HENRY CAREY BAIRD & CO., INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS 310 Walnut St., Philadelphia, Pa., U.S.A.

SANITARY SOAP VASE

PREVENTS disease, waste, pilfering of soap, clogging of waste pipes, stain of marble, uncleanly soap dish. AFFORDS each user fresh, dry pure soap. The Only Clean, Sanitary, and Safe way to use soap.

W. R. RANNIE, Rochester, N. Y., U. S. A.

SANITARY NOTES AND BEAMS.—Presidential address read by A. L. Gihon, M.D., before the Section in Hygiene, Climatology, and Demography of the Pan-American Medical Congress, Sept. 5, 1893. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 935. Price 10 cents. To be had at this office and from all newdealers.

BULL'S-EYE THE NEW KIND OF CAMERA.

Illustrated in SCIENTIFIC AMERICAN, March 31st, p. 197 LIGHT PROOF FILM CARTRIDGES. NO DARK ROOM REQUIRED.

Best and Most Practical Camera in the World regardless of price. Prices, \$8 to \$15. Send for Description, with Sample of Work. Boston Camera Mfg. Co., 382 Tremont St., Boston, Mass.

VANDUZEN STEAM PUMP

THE BEST IN THE WORLD. Pumps Any Kind of Liquid. Always in Order, never Clogs nor freezes. Every Pump Guaranteed. 10 SIZES. 200 to 12000 Gallons per Hour. Cost \$7 to \$75 each. Address THE VANDUZEN & TIFT CO., 102 to 108 E. Second St., Cincinnati, O.

VEGETABLE PARCHMENT.—A VALUABLE paper on the properties, uses and manufacture of this product. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 940. Price 10 cents. To be had at this office and from all newdealers.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL FINE FINISH. THOMAS DEVLIN & CO. LEHIGH AVE. & AMERICAN ST. PHILA.

DEAFNESS and HEAD NOISES

relieved by using 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. WILSON EAR DRUM MFG. CO., LOUISVILLE, KY.

Riers Patent Medicated Hair-Cloth Lined HARNESS PAD for sore backs and necks on horses. A sure cure. An absolute preventive. GEO. E. ELY & CO., ROCHESTER, N. Y.

Perfect Newspaper File

The Koch Patent File, for preserving Newspapers, Magazines, and Pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 by mail, or \$1.25 at the office of this paper. Heavy board sides, inscription "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper. Address MUNN & CO., Publishers SCIENTIFIC AMERICAN

BARGOCK & WILCOX CO. WATER TUBE STEAM BOILERS. 30 CORTLANDT ST. 107 HOPE ST. GLASGOW, SCOTLAND. MANUFACTURED IN UNITED STATES BY FOLKING FRANKLIN, DENVER, CO., U.S.A.

The Scientific American PUBLICATIONS FOR 1894.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

Table with columns for publication name and price. Includes Scientific American (weekly), Scientific American Supplement (weekly), Scientific American Spanish Edition (monthly), Scientific American Architects and Builders Edition (monthly), and combined rates for multiple subscriptions.

THE "MUNSON" TYPEWRITER. This machine is an "evolution," the outgrowth of years of experience and the best results of scientific work. Its principles appeal at once to the educated mechanic. It is Light, Small, Compact, Easily operated, with Universal Key Board. INTERCHANGEABLE STEEL TYPE WHEEL, durable and easily kept in order. 30 keys, 90 characters. Weight, with carrying 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, Ill., U. S. A.

Patent ROCK EMERY MILL STONES. Next to Diamonds in Hardness and Durability. Made to Fit Any Mill Frame without change. Cuts every substance with unexampled rapidity; always sharp; emery face Never Dressed. As much more Durable than other stones as they are Harder. Never Glaze; grind everything. Most Rapid Grinder known. Send for Circular. STURTEVANT MILL CO., Boston, Mass.

ARMSTRONG'S PIPE THREADING AND CUTTING-OFF MACHINES. Both Hand and Power. Sizes 1 to 6 inches. Water, Gas, and Steam Fitters' Tools, Hinged Pipe Vises, Pipe Cutters. Stocks and Dies universally acknowledged to be THE BEST. Send for catalog. Armstrong Mfg. Co., Bridgeport, Conn.

SCIENTIFIC BOOK CATALOGUE. 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, 361 Broadway, New York.

STEVENS PATENT IDEAL PENCIL DIVIDERS. No. 69. Sent by mail, postpaid. 3 inch only... \$1.75. Our goods excel, for neatness and fine finish, any other make. Ideal and Leader Spring Callipers and Dividers, Ideal Surface Gauges, Depth Gauges, and Fine Machinists' Tools. J. STEVENS ARMS & TOOL CO., P. O. Box 280, Chicopee Falls, Mass.

REID'S LIGHTNING BRACE. SPECIALLY DESIGNED FOR LIGHT BORING SCREW DRIVING &c. NICKEL PLATED ROSEWOOD TRIMMING. Circular Free. A. H. REID, 3003 Market St., PHILADA.

BELTING of Various Styles, ELEVATORS, CONVEYORS, COAL MINING and HANDLING MACHINERY. The JEFFREY MANUFACTURING CO., COLUMBUS, O. Branches: CHICAGO-NEW YORK.

PATENTS. CAN I OBTAIN A PATENT? For a prompt answer and an honest opinion, write to MUNN & CO., who have had nearly fifty years' experience in the patent business. Communications strictly confidential. A Handbook of Information concerning Patents and how to obtain them sent free. Also a catalogue of mechanical and scientific books sent free. Patents taken through Munn & Co. receive special notice in the Scientific American, and thus are brought widely before the public without cost to the inventor. This splendid paper, issued weekly, elegantly illustrated, has by far the largest circulation of any scientific work in the world. \$3 a year. Specimen copies sent free. Building Edition, monthly, \$2.50 a year. Single copies, 25 cents. Every number contains beautiful plates, in colors, and photographs of new houses, with plans, enabling builders to show the latest designs and secure contracts. Address MUNN & CO., NEW YORK, 361 BROADWAY.

RAILWAY & STEAM FITTERS SUPPLIES

Rue's Little Giant Injector. Screw Jacks, Portable Forges & Blowers. JOHN S. URQUHART, 46 Cortlandt St., N. Y.

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

INVENTORS. Write us. We have perfect facilities for producing their Models and manufacturing their Electrical and Mechanical Specialties. SOUTHERN ENGINEERING CO., Electrical and Mechanical Engineers, Louisville, Ky.

NEPERA PAPER. A New Printing-Out Ready Sensitized Paper. PERMANENT PRINTS. Better Results, Easier Obtained. No Ice. No Hot Water Treatment, No Lead Salts, No Alum or other hardeners endangering the durability of the image. Extreme simplicity of all operations. Printed, toned, and mounted in less time and with less trouble than any other paper. Does not bronze and does not fix out. A paper for all climates and all seasons. Will stand a hot water test of 100° F. and will behave just as well in the cold water. Has none of the defects of its rivals. Write for free sample sheets. Ask for prices of our Special Bromide Paper. For sale by All Dealers. Nepera Chemical Co., Nepera Park, N. Y.

THE SIMPLEX TYPEWRITER. 250 GUARANTEED. To do as good work as any high priced machine. Specially adapted for use in private correspondence. Sent by mail or express, prepaid on receipt of \$2.75. In handsome walnut case, in extra Address Simplex Typewriter Co., 26 E. 13th St., New York

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newdealers in all parts of the country.

Study Electricity at Home

by our correspondence method. Terms low. Experiments. Circulars free. Scientific Machinist, Cleveland, O.

SCIENTIFIC AMERICAN DYNAMO. Description of a plain shunt-wound dynamo of simple construction, capable of supplying a current of from 60 to 75110-volt 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. 865. Price 10 cents. To be had at this office and from all newdealers.

MANUFACTURING RUBBER STAMPS. by our improved process, with a "New York" vulcanizer, is pleasant and profitable work, requiring little capital. Our vulcanizers received Highest Award, Medal, and Diploma, at World's Fair, 1893. Circulars free. Barton Mfg. Co., 336 Broadway, N. Y.

EGGS OF THE GREAT AUK. MR. J. C. STEVENS will sell by auction, at his Great Rooms, 38 King Street, Covent Garden, London, England on Tuesday, April 24, TWO RECENTLY DISCOVERED EGGS OF THE GREAT AUK (Alca Impennis), a MAGNIFICENT EGG OF SPORNIS MAXIMUS, and other interesting eggs.

HE IS DEAD. To his own interest, who deals in Arms and Ammunition, or who shoots a Rifle Pistol, or Shot Gun and has not a copy of IDEAL HAND BOOK, No. 4, A 80 page of solid information. Just out. (Mention Scientific American) BE ALIVE and send for this book to all countries. Send orders for postage. IDEAL MFG. CO., Drawer 560, New Haven, Ct., U. S. A.

NOTICE TO INVENTORS AND OTHERS WHO desire to submit small arms to test for adoption for the Naval Service.—NAVY DEPARTMENT, WASHINGTON, D. C., March 15, 1894.—The Department hereby publishes that on August 1, 1894, a Naval Board will convene at the Naval Torpedo Station, Newport, R. I., for the test of Magazine Rifles suitable for adoption for the Navy and Marine Corps. The tests will be for the selection of a breech closure and magazine adapted to the caliber and ammunition already decided upon by the Department, and only such arms will be considered as are submitted subject to the specifications and tests laid down in the circular which will be furnished upon application to the Bureau of Ordnance, Navy Department, Washington, D. C. Persons wishing to submit arms must deliver them to the Inspector of Ordnance at the Naval Torpedo Station, Newport, R. I., on or before August 1, 1894. H. A. HERBERT, Secretary of the Navy.

Adjustable Band Fasteners For TANKS OF ALL KINDS. The Best in the World. Try them and you will never build a tank without using this fastener. We make a specialty of Washington Fir and Louisiana Cypress Tanks. For circulars and prices address, mentioning this paper, The WINSHIP MFG. CO., Cor State and Huron Streets, RACINE, WIS.

IMPROVEMENT OF THE DANUBE.—Full particulars of the great engineering work of rendering the course of the Danube River regular by diking it, giving it a uniform width of 300 meters and forming a new channel through its bends. With 10 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 943. Price 10 cents. To be had at this office and from all newdealers.

WATER MOTORS

GAS ENGINES & VENTILATING FANS. The best Motor in the world for driving all kinds of light machinery, noiseless, non-combustible, invaluable for blowing church organs, running printing presses, coffee mills, ventilating fans, ice cream freezers, meat choppers, etc. In use the world over, and recommended by water companies everywhere. Address for circular, Hackensack Water Motor Co., Newark, N. J., U.S.A.

THE SCIENTIFIC AMERICAN

ESTABLISHED 1845. 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 SCIENTIFIC 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, Archeology, 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, Canada, and Mexico, \$5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for \$7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check. MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid mass 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 Plans, Descriptions, Locations, Estimated Cost, 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 newdealers. \$2.50 a year. Remit to MUNN & CO., Publishers, 361 Broadway, New York.

THE LINK-BELT COMPANIES, PHILADELPHIA, NEW YORK, OHIOAGO. Originators of the best practice in the use of Link-Belt of standard designs. Ewart Link-Belt (31 regular sizes). Sprague Wheels, Rope Transmissions, Fibre-Graphite Self-Lubricant Journal Bearings. Machinery for elevating and conveying any material. Philadelphia address, 2020 Hunting Park Av.

GATES ROCK & ORE BREAKER. Capacity up to 200 tons per hour. Has produced more ballast, road metal, and broken more ore than all other breakers combined. Builders of High Grade Mining Machinery, King-Darragh Concentrator, Connersville Blowers. Send for Catalogues. GATES IRON WORKS, 30 C. So. Clinton St., Chicago. 136 C. Liberty St., N. Y. 237 C. Franklin St., Boston, Mass.

Model & Experimental Work. Absolute accuracy. Advice and ideas not charged for. Send for particulars GARDIN & SON, 38 John Street, NEW YORK.

DEAFNESS & HEAD NOISES CURED by INVISIBLE Tubular Cushions. Have helped more to good hearing than all other devices combined. Whispers HEARD! Help ears as glasses help eyes. F. Hiseox only, 858-B-Bway, N.Y. Book of proofs FREE.

The Improved Monitor Incubator. Hundreds of testimonials as to its merits over all other makes. MEDALS and DIPLOMA AWARDED AT THE WORLD'S FAIR. Large book with cuts for stamp. BUY THE BEST. A. F. WILLIAMS, 61 RACE ST., BRISTOL, CONN.

SPECIALTY CO., DECATUR, ILL., Manufacturers, Agents and Dealers in Specialties, solicit propositions from manufacturers or owners of patents for the handling of office specialties and novelties of merit.

VOLNEY W. MASON & CO. FRICTION PULLEYS, CLUTCHES, and ELEVATORS PROVIDENCE, R. I.