The Twenty-Seventh Edition of a Deservedly Popular Technical Book, The Painter, Gilder and Varnisher's Companion. Revised, Enlarged, and Improved.

JUST READY.

Price, \$1.50

Free of Postage to any address in the World.

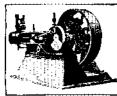
'HE PAINTER, GILDER AND VARNISHER'S COMPANION.

Comprising the Manufacture and Test of Pigments, the Arts of Painting, Graining, Marbling, Staining, Signification, Varnishing, Glass-Staining, and Gliding on Glass; together with Coach Painting and Varnishing, and the Principles of the Harmony and Contrast of Colors. Twenty-seventh edition. Revised, enlarged, and in great part rewritten. By William T. Brannt. Editor of "Varnishes, Lacquers, Printing Inks, and Sealing Vases." Illustrated. In one volume, 12mo, 415 pages, bound in cloth.

Price \$1.50, free of postage to any address in the world. LEF A Circular of 20 pages, showing the full Table of Con-tents of this Useful and Popular Book, will be sent free of postage to any one in any part of the World who will fur-nish his address.

HENRY CAREY BAIRD & CO. INDUSTRIAL PUBLISHERS, BOOK SELLERS & IMPORTERS

810 Walnut St., Philadelphia, Pa., U. S. A.





VELOCITY OF ICE BOATS. DELIOCATY OF ICE BOATS. A COLDINECTION of interesting letters to the editor of the Scientific American on the question of the speed of ice boats, demonstrating how and why it is that these craft sail faster than the wind which propels them. Illustrated with 10 explanatory diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 214. Price 10 cents To be had at this office and from all newsdealers.



TELEPHONES. Receivers, \$1 25 each.

All Parts of Receivers, Magneto Bells, Cords Wire, etc. Complete Battery Phones, Private Line and Warehouse Phones. Dynamo Motor and Engine Castings. Electrical Supplies. Send Stamp for New Catalogue.

PALMER BROS., Mianus, Conn.

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



Riggs Patent Medicated HairCloth Lined HA RNESS PAD for sore backs and necks on horses. A sure cure. An absolute preventive. GEO. E. ELV. & CO., ROCHESTER, N. Y.

REFINING OF PETROLEUM OIL An interesting description of the process of refining petroleum as practiced at the various plants of the Standard Oil Company, with 4 illustrations. Contained in Scientific American Supplement. No. 944. Price Il cents. To be had at this office and from all newsdealers.



KNITTING MACHINERY.

Knitted underwear is in vogue. The best

machinery for its manufacture, such as SHIRT MACHINES, SLEEVERS, BAR STITCH MACHINES, etc.,

are made by SCOTT & WILLIAMS, 2077 E. Cumberland Street, Established 1865. Philadelphia, Pa., U. S. A.

VOCAL PHYSIOLOGY AND SYSTEM stic Voice Training for the Prevention of Diseases of the Larynx.—A valuable paper by J. W. Park, M.D. pointing out the importance of a systematic training of the voice in public schools and colleges for the preven-tion of some of the most prevalent diseases of the larynx. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 931. Price 10 conts. To be had at this office and from all newsdealers.

BATES 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. Send for Uatalogues. CATES IRON WORKS, OCTOBER

136 C. Liberty Street, New York. 27 C. Franklin St., Boston, Mass



M

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 principal 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.

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 various 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, elegantiy bound in cloth. Price \$2.50, postpaid.

MUNN & CO., Publishers, 361 Breadway, New York,

The Remington Typewriter. WEHICLES and HAI



As Perfect in Design and Construction as Original Ingenuity, Long Experience, and Constant Improvement can make a Writing Machine. It is Simple, Well Made, Practical, Durable, Easy to Learn and to Operate.

Wyckoff, Seamans & Benedict, 327 Broadway, New York.

ARTESIAN WELLS—BY PROF. E. G. Smith. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 943. Price 10 cents. To be had at this office and from all newsdealers.



SANITARY SOAP VASE

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

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

Anyone interested LIGHT MATERIAL that may in the sale of a LIGHT MATERIAL that may in the sale of a control or rubber in the manufacture of a type surface plate for printing purposes, may find a market for their product by communicating with I. H. WHIPPLE, 487 Washington Boulevard, Chicago, III.

EAFNESS



and HEAD NOISES relieved by using Wilson's Common Sense Ear Drums New scientific invention, entirely different in construction from all other devices. As-sist the deaf when all other devices fail, and where medical skill bas given no relief. They are safe, comfortable, and invisible, have no wire or string attachment. Write for pamphlet.

AMATEUR PHOTOGRAPHERS.

Finish your own photos, on Colorite Paper. Requires no experience, long washings or expensive solutions. Entirely new process. Samples and full particulars free. CELERITE PAPER CO., oor, 33th and State Streets, Gerald Building, Chicaen, III.

ATMOSPHERIC RAILWAY.-Description of a project for rapid transit dating back to the year 1848. A curiosity in the history of railroading, With 6 illustrations. Contained in SCIENTIFIC AMER-ICAN SUPPLEMENT, No. 922. Price 10 cents. To be had at this office and from all newsdealers.



WANTED. A Thorough and Practical Mechanic. One who is well versed in iron and wood-working machinery in detail, and pose-ses executive ability and capable of managing men. Undoubted references required. State age and past experience. All communications confidential. Address R. & B. MFG. CO., Box 1592, Philadelphia, Pa.



TELEPHONE'S \$1.25 Each. WITH CORD, \$1.50 EACH.

GeneralElectric Equipment and Telephone Supplies.

STANLEY & PATTERSON, 32 & 34 Frankfort St., New York.



We will lease you a 10 h. p. Motor or a 125-light Dynamo for 27 months, for 10 per month. You can then buy it for \$5. Other sizes on similar terms. Hobart Elec. Co., Middletown, O. DYNAMOS and MOTORS

MIXING MACHINERY.

Latest Improved. For all purposes. 150 different kinds and sizes. J. H. DAV & CO., Cincinnati, Obio.



98∪ USE GRINDSTONES? If so, we can supply you. All sizes, mounted and unmounted, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes.

The CLEVELAND STONE CO. 2d Floor. Wilshire, Cleveland, O.

Have you seen our ILLUMINATED COLOR WORK?



\$60 National Cut this out Typewriter.

Standard Keyboard. Complete Catalogue E."

Perfect Manifolder. Chine made. Simplest, Strongest. Chine made. 23d and Arch Sts., Philadelphia, Pa.

Four Specials
Marchoffer
toReadersor
Scientife American



MAKE YOUR- MECHANICAL ENGINEER OR DRAUGHTSMAN

Or qualify to take charge of or to superintend the manufacture of machinery, by devoting your idle hours to Home study by the method of THE CORRESPOND-ENCE SCHOOL OF MECHANICS, Scranton, Pa. To begin, students need only know how to read and write. Moderate charges. Send for FREE Circular.



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. Rullding 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. nouses, with plans, successful attest designs and secure contracts. Address MUNN & CO., NEW YORK, 361 BROADWAY.

MY postid WIFE CANNOT SEE HOW YOU DO
IT AND PAY FREIGHT.

SM Bays oor Pitswer walnut or oak Improved High arm Singersewing machine
doely Buished, nickel plated, adapted to light
and heavy work; graranted for 10 Years; with
Antimatic Robbin Window, Self-Threaging Cylin-

der Hintlie, Bell-Seitling Needle sit in complete wet of Rivel Altaziments; shipped any where on SO Day's Trial. No money required in advance. 75,000 now frusts. World's Fair Medal awarded machine and attachments. Bay from factory and save dealer's and agent's profitence, Bay from factory and save dealer's and agent's profitence to the Onk and send lo-day for machine or large free FREE Cast This Out and send lo-day for machine or large free Cast This Out on the South Charles of the World's Fatt. ONFORD MFB. CO. 342 Wabash Ave. CHICASO, ILL.

TECHNICAL SCHOOLS: THEIR PURpose and its Accomplishment.—By Prof. R. H. Tingston. A paper discussing the importance to the people and to the nation of the introduction and perfection of technical education in the United States, and its development as a part of a state and national system. Cuntained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 934 and 935. Price ID cents each. To be had at this office and from all newsdealers.

STEREOPTICONS.
MAGIC LANTERNS AND
ACCESSORIES, SEND FOR CATALOGUE TO CHAS BESELER MAKER 218 CENTRE ST.

PILOCARPINE.—A VERY EXHAUST TILOGARI'INF.—A VERY EXHAUSTive and valuable paper by D. W. Prentlas. M.D., glying the physiological action and therapentic uses of the drug, with citations of cases of change of color of the hair through its action. Contained in Scientific American Scipilement, Nos. 931, 932 and 933, Price II cents each. To be had at this office and from all newsdealers.



Simple, Perfect, Nelf-Regu-bittip. Thousands in suc-peasaful opuration. Gazan-teed to hatch a larger per-centage of fartile aggs at less cost than any other Hatcher. Lowest priced first class Hatcher made.

UNIVERSAL POLYMERISM Polysteriam. By Henry Wurtz, Ph.D. A discussion of the subject of the liability of metals and all otherbodies (both liquid and solid) to variations in density, a principle of shemistry which the author believes to be as universal, as fundamental, and as important as any other whatever. With a table of the minimum and unaximum densities of the best known elements of matter. Contained in Scientific American Supplement, No. 938. Price Ill counts. To be had at this office and from

FOR SALE.—A Diamond Drill with full outsit of tools, for one-third its value. In fine order, Apply to G. T. WILLIAMS, CARANOVA, VA.





"THE **DENSMORE**"

is pronounced "The World's Greatest Typewriter" by its users because of its Great Convenience and the Number of Ends attained, Light Key Touch, Ease of Operation and Rapidity, Wearing Qualities and the Provision for Good Alignment, Compactness, Proportion, Finish and Beauty.

Recently adopted on competition by the U. S. War Department. Eighteen ust ordered for the use of the Boston Globe. Twenty in use by the Carnegle steel Co. The 1894 Model contains strong new features that are attracting nuch attention. Offices in all the principal cities. Pamphlets Free.

DENSMORE TYPEWRITER CO., 202 Broadway, New York.

ver as the Best and Chempes of Sartings Single Buggy Harness, 15.70 Single Farm Harness, 17.67 Inouble Farm Harness, 53.95 Top Buggles, 55.95 Road Carts, 14.90 Road Wagons, 43.50 Spring Wagons, 43.50 Farm Wagons (20.50 Per Carts) (20.50 Per Carts

Fine 160 page Catalogue, free.
Wilber H. Morray Mg. Co., Cincinnati, O.

THE MOON'S FACE.—BY G. K. GIL-bert. An interesting slidy of the origin of the features of our satellite, crater characters, volcanic theory, tidal theory, snow theory, meteoric theories, moonlet theory, arched floors, distribution and overlap, sculpture, furrows, Wargentin plateau, rills and rill pits, white streaks, growth of the moon, age of the moon. With 14 illustrations. Contained in Scientific American Supplement, of the moon of the moon of the moon of the moon. To be had at this office and from all newsdealers.

TOWERS AND TANKS

PATENT SECTIONAL ALL IRON TOWERS of 4 and 12 Columns, for

Water Works, Cities, Towns and Manufactories.

PLAIN, ALL WOOD TOWERS. ELEVATED TANKS

for Automatic Fire Sprinkler Plants. Manufacturers of Iron and Steel Tanks. Louisiana Red Cypress Wood Tanks a Specialty.

W. E. CALDWELL CO.

219 E. Main Street. LOUISVILLE, KY., U. S. A.

CONSULTATION INVENTORS.

Experimental work of every description. Automatic machinery designed and built. The Send for circular.

MALTBY MFG. CO., Brooklyn, 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 and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 by mail, or \$1.5 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

\$20 TO \$60 SAVED ON NEW BIC Y CLES
\$125 high grade Safety
\$50, \$100 pneu. \$60, \$40

standard beaution of the same period of the

ICE-BOATS-THEIR CONSTRUCTION And Management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sailing boats used on the Hudson river in winter. By H. A. Horsfall, M.E. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 1. The same number also contains the rules and regulations for the formation of ice-boat clubs, the saling and management of ice-boats. Price 10 cents.

Send Samples for prices to the Curtis Automatic Machine Screw Works, 103 Court St., New Haven, Conn.





UNDERGROUND ELECTRIC RAILway.—A condensed account of the City & South London Railway, showing its essential features and giving some of the more important of its details. With one illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 935. Price 10 cents. To be had at this office and from all newsdealers.

MACIGLANTERNS WAN ED AND FOR BALL HARBACH & CO. 809 Filbert St. Phila.Pa

IRON, STEEL WORK FOR BUILDINGS LAWN FENCES
STABLE FITTINGS GREY IRON CASTINGS MEDIUM
HEAVY WEIGHTO ORDER CAST WASHERS, BENTA FORCED STRAPS

The Scientific American PUBLICATIONS FOR 1894.

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

RATES BY MAIL,

The Scientific American (weekly), one year The Scientific American Supplement (weekly), one year, 5,00 The Scientific American, Spanish Edition (monthity), one year, The Scientific American Architects and Builders Edition (monthly), one year, COMBINED RATES.

The Scientific American and Supplement - \$7.00
The Scientific American and Architects and Builders Edition, - 5.00 The Scientific American, Supplement, and Archi-

tects and Builders Edition, - - -Proportionate Rates for Six Months. This includes postage, which we pay. Remit by postal rexpress money order, or draft to order of

MUNN & CO., 361 Broadway, New York.

© 1894 SCIENTIFIC AMERICAN, INC