

Founded by Mathew Carey, 1786.  
**HENRY CAREY BAIRD & CO.**  
 Industrial Publishers, Booksellers, and Importers,  
 510 Walnut St., Philadelphia, Pa., U. S. A.  
 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.

**TENS** of thousands of visitors to the World's Fair felt a sense of regret at their ignorance of recent advances in many very common branches of science and the mechanic arts. The need of keeping abreast of current achievement and discussion is met by the brief articles from authoritative pens, free from technicalities, to be found in **THE POPULAR SCIENCE MONTHLY**.

Sold everywhere, 50 cents a copy.  
 Subscription price, \$5.00 a year.  
**D. APPLETON & Co., New York.**

**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. Send for Catalogues.  
**GATES IRON WORKS,**  
 50 C So. Clinton St., Chicago  
 136 C. Liberty Street, New York  
 237 C. Franklin St., Boston, Mass

**Valuable Patent For Sale, No. 505,482**  
 Machine for Sawing Logs, Trees or Spiles. For Dock Building, Lumbermen, Cutting Telegraph Poles, etc., making a perfect cut at any angle.  
**A. R. SEARLY, 48 West 18th Street, New York.**

**DEAFNESS**  
 and HEAD NOISES relieved by using **Wilson's Common Sense Ear Drums**. New scientific invention, entirely different in construction from all other devices. Assists 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.

**Model & Experimental Work.** Absolute secrecy. Advice and ideas not charged for. Send for particulars **GARDAM & SON, 36 John Street, NEW YORK.**

**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, Philadelphia, Pa., U. S. A.**

**LIFE SAVING DEVICES.**—A COLLECTION of suggestions of devices for communicating between the shore and stranded vessels, offered to the *London Daily Graphic* by various correspondents. With 100 illustrations. Contained in **SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900.** Price 10 cents each, or \$1.00 for the series. To be had at this office and from all newsdealers.

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

**WHO can supply Automatic Machines for Manufacturing Pressed Steel Vessels in large quantities? Officers should be sent marked M. 4217. Rudolf Mosse, Hamburg, Germany.**

**BUY THE FOX PATENT SAFETY RAZOR**  
 EVERY MAN'S OWN BARBER  
 MAKES SHAVING A LUXURY  
 NO DANGER OF CUTTING  
 SKIN DISEASES PREVENTED  
 RAZOR \$2.00. STROPPING MACHINE & STROP \$1.75.  
 BOTH IN ONE BOX \$3.75 BY MAIL FREE  
**E. LOTHAR SCHMITZ, DEALER**  
 92 & 94 READE ST. NEW YORK.

**There is a Market for Your Specialties in England.**  
 Agencies for Novelties Wanted.  
**RANKIN & CO.,**  
 Merchants and Manufacturers Agents,  
 7 Snow Hill, London, E. C.  
 English and American References.  
 ACCOUNTS GUARANTEED.

**EVERY WATCH GUARANTEED NO KEY REQUIRED**  
**NEW \$1.50**  
**AMERICAN WATCH & CHAIN**  
 The cut exactly represents the new 1894 American Lever Watch and Chain. It is not an imported watch, but entirely American produced in this country by the best skilled mechanics. Neither is it a clock, but a perfect watch of ordinary size, 2 1/8 inches in diameter, 1-4 larger than cut. It is perfect in mechanism and we furnish with each a **POSITIVE GUARANTEE** as an accurate time-keeper for one year. Our factory produced last year nearly 500,000 watches and we have proven beyond doubt that America can make not only the BEST but the CHEAPEST watches. Do not be deceived by its low price or your past experience with other watches. Though cheap, it is good. The publisher of this paper will tell you that our guarantee may be relied on. **DESCRIPTION:** The movement is regular American Lever; Lantern motion; 240 beats to minute; keyless (or stem) wind and set; 4 turns runs 24 hours; steel pinions; all parts of great durability and perfectly adjusted; patent escapement; an automatic regulator; dust proof case, handsomely finished in nickel or gilt; weight of watch 5.8 oz. Diameter 2 1/8 in.; fully **GUARANTEED** one year—same as an Elgin or Waltham. **SAMPLE** post-paid with **HANDSOME CHAIN & catalogue** \$1.50; 3 for \$4.00; 12 for \$12.00 by Express. **AGENTS and Storekeepers** apply at once. Mention Paper. **R. H. INGERSOLL & BRO., 65 CORTLAND ST., N. Y. CITY**

**OF INTEREST TO FOUNDRYMEN!**  
 We wish to license a few more firms to manufacture our radiators, for steam and hot water heating, under a small royalty. This is a growing and profitable business specialty and is under strong patents. Will sell a complete outfit of flasks and patterns to start producing. No experimenting. Our late improvements make our radiators the best in the market. Agents wanted for the sale of our goods. Correspondence solicited from foreign countries.  
**HOLLAND RADIATOR CO.**  
 Works, Bremen, Ind. Office, 89 Lake St., Chicago, Ill.

**THE SIMPLEX TYPEWRITER**  
**250** **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, 50¢ extra.  
**Address Simplex Typewriter Co., 37 Great Jones Street, New York.**

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

**THE "CLIMAX" Stereotyper and Moulding Press**  
 combined, for making perfect Celluloid Stereotypes to be used in place of metal stereotypes. Also for making Rubber Stamps. Should be in use in every printing office.  
 See Sci. Am., Dec. 30, 1893. Send for circular to  
**THE J. F. W. DORMAN CO.,**  
 217 E. German St., Baltimore, Md.  
 Manufacturers of Rubber Stamps, Vulcanizers, Stereotype Machinery and Supplies.

**HARRISON CONVEYOR!**  
 For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.  
 Send for Circulars. **BORDEN, SELLECK & CO., Sole Mfgs., Chicago, Ill.**

**THE "OLIN" GAS AND GASOLINE ENGINES,**  
 FROM 1 TO 10 HORSE POWER, FOR ALL POWER PURPOSES.  
**THE OLIN GAS ENGINE CO.,**  
 222 CHICAGO STREET, BUFFALO, NEW YORK.

**PATENTS**  
**CAVEATS, TRADE MARKS, COPYRIGHTS.**  
**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.**

**SMALL** Mfrs. metal goods can find reliable agent. Commission. **C. B. Lord & Thomas, Chicago.**

**AGENTS COIN**  
 Money selling Beveridge's Automatic Cooker. Latest and best cooking utensil ever invented. Sells at sight. One Agent sold over 1700 in one town. One sample Cooker free to good agents. Advertising matter furnished. For full particulars address **W. E. BEVERIDGE, Box 728, BALTIMORE, Md.**

**Family Ice Machine** Ice, etc., in a few minutes, \$10 and up. Filters, \$1.25 and up. Cookers, \$1. Seltzateurs to prepare one's self soda water, \$4.50 and up. **L. DERMIGNY, 126 W. 26th St., N. Y.**

**\* 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, 30 characters. Weight, with carriage 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.**

**L. G. WINN MFG. CO.**  
 116 S. Pennsylvania St., Indianapolis, Ind.  
**Models and Experimental Machinery.**  
 Will make any trick or device wanted.  
 Articles Manufactured for the Trade.  
 Write for information books and prices.

**HYPNOTISM: its Uses and Abuses.** The science easily acquired. Illustrated book, \$1. Prof. Anderson, S. A. 2, 182 State St., Chicago.

**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, 1883. Circulars free.  
**Barton Mfg. Co., 336 B'way, N. Y.**

**MATCH MACHINERY, LATEST IMPROVED.**  
 Complete plants furnished. **JOS. C. DONNELLY, 1209 Buttonwood Street, Philadelphia, Pa.**

**BARGOCK & WILCOX WATER TUBE**  
 30 CORTLAND ST. N. Y. CITY  
 107 HOPE ST. GLASGOW, SCOTLAND  
**STEAM BOILERS**  
 MANUFACTURERS IN UNITED STATES, SCOTLAND, IRELAND, AUSTRIA

**BITUMEN TUBES.** Makers of machinery for casting these tubes will please send prices and particulars to **JULIUS CARSTANJEN, Dulsberg, Germany.**

**FASTER THAN SHORTHAND!**  
 Anderson's Shorthand Typewriter prints a word as one stroke! Price, \$25. Weight, 3 lbs. It is a perfect substitute for stenography, and has already taken its place in many of the largest establishments in the country. You can learn at home without a teacher; no knowledge of shorthand necessary. Don't waste your time; begin practice NOW and you will be ready for WORK next month. **G. K. Anderson, 8th Floor World Building, New York City, U. S. A.**

**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.**

**MONEY IN SPRING CHICKENS.**  
 The Hen is Not in It!  
 The instructive egg hatcher does the business. Price, \$17.00. Big money. Send 4c. for Catalogue No. 45. It tells all. 2000 sold in 1893.  
**BUCKEYE INCUBATOR CO., Springfield, Ohio.**

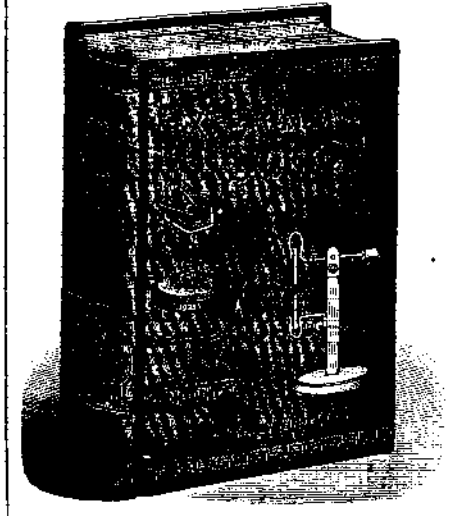
**WORTHLEY STALL WORKS, 63 Elm St., Boston, Mass.,** have sold 8000 of his Patent 25-lb. Slow Feed Oat Mangler. Price, \$1.44. **VAN NESS CO., 60 Warren St., N. Y. W. Y. WARNER, 140 N. Broad Street, Phila.**

Send 5, 2-cent stamps for copy **World's Fair Souvenir** and figures on quantities to manufacturers, **J. W. TAYLOR, OWINGS BUILDING, CHICAGO, ILL.**

**MALLEABLE** AND FINE GRAY IRON & STEEL CASTINGS FROM SPECIAL PATTERNS. **THOMAS DEVLIN & CO., LEHIGH AVE. & AMERICAN ST. PHILA.**

**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**, 80 pages of solid information. Just out. (Mention *Scientific American*) BE ALIVE and send for one FREE to all countries. Send stamps for post. **IDEAL MFG. CO., Drawer 860, New Haven, Ct., U. S. A.**

**NOW READY!**  
**Fourteenth Edition of Experimental Science**



REVISED AND ENLARGED.  
 120 Pages and 110 Superb Cuts added.

Just the thing for a present for any man, woman, student, teacher, or any one interested in science. In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects, new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc.; Systems of Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.  
 840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, \$4. Half morocco, \$5.  
 Send for illustrated circular.

**MUNN & CO., Publishers,**  
 Office of the **SCIENTIFIC AMERICAN,**  
 361 BROADWAY, NEW YORK.

No man seeking small power, one, two and three H. P., would buy anything but the **OLDS GASOLINE ENGINE** if he investigates its merits, which are the cause of its wonderful demand where introduced.  
 Send for '94 Catalogue  
**P. F. OLDS & SON,**  
 Box 218, Lansing, Mich.

**THE FISHER Patent Steam Pump Governors**  
 For Steam Pumps Working under Pressure and the **FISHER PATENT GRAVITY GOVERNORS**  
 For Steam Pumps filling elevated open tanks, are the most positive and durable devices made for the purpose.  
**REDUCING VALVES.**  
 Send for circulars and testimonials. **FISHER GOVERNOR CO.,**  
 201 S. 1st Avenue. - - Marshalltown, Iowa.

**AUTOMATIC SHELL EXTRACTOR**  
**HILL.**—He Pays the Express on this American-made Revolver. Full Nickel Plated, Rubber Stock, Center Fire, .32 or .38 Caliber, Five Shot, 8-in. long, rifle barrel 3 1/2 inch Long fitted cylinder, 100 curved hammer which prevents accidental discharge. Weight 16 oz. Cut this out and we will ship by express C. O. D. \$4.50. We pay all charges.  
**W. HILL & CO.,**  
 207 State Street, Chicago.

**HOME ELECTRIC MEDICAL BATTERY**  
 Used and recommended by all physicians as infallible for Rheumatism, Neuralgia, and all nervous troubles. Send for Free Circular. **AGENTS WANTED** everywhere. \$10 A DAY easily made. **T. C. RAFFERTY & CO., Chicago, Ill.**

**ELECTRICITY**  
 By our correspondence method; 6 thorough courses; Experiments; reasonable Terms. Circulars Free. **The Scientific Machinat Co. Cleveland, O.**

**WOODEN TANKS** FOR RAILROADS, MILLS, FARMS, etc. LARGE WATER TANKS. PLANS & A SPECIALTY. SPECIFICATIONS FURNISHED FREE. **W. CALDWELL CO.**  
 No. 217 E. MAIN ST. LOUISVILLE KY.

**The Scientific American PUBLICATIONS FOR 1894.**

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

Publication	Price
The Scientific American (weekly), one year	\$3.00
The Scientific American Supplement (weekly), one year	5.00
The Scientific American, Spanish Edition (monthly), one year	3.00
The Scientific American Architects and Builders Edition (monthly), one year	2.50
COMBINED RATES.	
The Scientific American and Supplement	\$7.00
The Scientific American and Architects and Builders Edition	5.00
The Scientific American, Supplement, and Architects and Builders Edition	9.00
Proportionate Rates for Six Months.	
This includes postage, which we pay. Remit by postal or express money order, or draft to order of	
<b>MUNN &amp; CO., 361 Broadway, New York.</b>	