### Advertisements.

Inside Page, each insertion --- 75 cents a line. Back Page, each insertion --- \$1,00 a line. Engravings may head advirtisements at the same rate per tine, by measurement, as the tatter press. Adver-tisements must be received at publication office as early as Friday morning to appear in next issue.



Jarvis Gas-Consum ng Furnace, For Setting Steam Bollors. Will burn screenings with mall mixture of soft coal without blower. Address A. F. UPTON, General Agent, No. 239 Congress Street Soston, Mass.



A GENTS WANTED. Package of Goods free to every applicant. Star Novelty Co., Charlotte, Mich.



MARKS, ETC. Messes, Muan & Co., in connection with the publica

tion of the Scientific American, continue to examine Improvements, and to act as Solicitors of Patents for

In this line of business they have had OVER THIRTY YEARS' EXPERIENCE, and now have unequaled facilities for the properation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messr. Munn & Co. also attend to the preparation of Caveats, Trade Mark Regulations, Copyrights for Books, Labels Reisenes, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate

We send free of charge, on application, a pamphlet containing further information about Patents and how to procure them; directions concerning Trade Marks Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents .- We also send, free of charge, Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventor should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five patents-embracing Canadian, English, German, French, and Belgian-will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is \$75; German, \$100; French, \$190; Belgian, \$100; Cana-

Copies of Patents .- Persons desiring any patent issued from 1836 to November 26. 1867, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office \$1.

A copy of the claims of any patent issued since 1836 will be furnished for \$1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A pamphlet, containing full directions for obtaining United States patents, sent free. A handsomely bound Reference Book, gilt edges, contains-140 pages and many engravings and tables important to every patentee and mechanic, and is a useful hand book of reference for everybody. Price 25 cents, matied free.

Address MUNN & CO.,

Publishers SCIENTIFIC AMERICAN. 37 Park Row, N. Y. OFFICE Corner of F and 7th Streets,

### CUARDIOLA'S

COFFEE & SUGAR MACHINERY Coffee, Malt. Corn, Cocoa, and Grain. Drying Machine. Coffee-Hulling and Polishing Machines. Coffee-Washing Machine. Helix Sugar Evaporator.

Messrs. C. ADO LPHÉ LOW & CO. 42 Codar Street, Messrs. MUNOZ & ESPRIELLA, 32 Fine Street, New York, are Mr. Guardiola's Agents, and they will give prompt attention to all orders for any of the above machines.

### Harrison's System of Grinding!

Hustrated Catalogue Now Ready.

NEW STANDARD FLOURING MILLS. Old Theories, Horizontal Grinders, Slow Runners, Fully Exploded. Fine Flour, High Speed, and Economical Milling Fully Extablished.

A NEW Copy For All.

Millers and Editors please address

EDWARD HARRISON,

No. 135 Howard Ave. New Haven, Conn.

### ESTABLISHED 1844.

JOSEPH C. TODD,

(Formerly of Todd & Rafferty), ENGINEER and MACHINIST. Flax. Hemp, Jute. Rope, Oskum, a d Bagging Machinery. Steam Engines, Hollers, etc. Also Agent for the celebrated and improved Rawson & Rittinger Hoisting Engine, I will furnish specifications and estimates for all kinds of machinery. Send for descriptive circular and price. Address.

J. C. TODD, 10 Barclay St., New York, or Paterson, N. J.

PUNCHING Drop Hammers and Dies, for working Metals, &c. THE STILES & PARKER PRESS CO., Middletown, Conn.

Calculating Machines. G. B. Grant, Beverly St., Boston.

HARTFORD STEAM BOILER

Inspection & Insurance

COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't. J. B. PIERCE, Sec'y.

Pyrometers, For showing heat of Ovens, Hot Biast Pipes, Boller Flues, Super-Heated Steam, Oil Stills, &c.
HENRY W. BULKILEY, Sole Manufacturer,
149 Broadway, N. Y.

ROCK DRILLING MACHINES AIR COMPRESSORS TURED BY BURLEIGHROCK DRUL OD PROPHECT FITCHBURG MASS SEND FOR PAMPHLET

### Mill Stones and Corn Mills

make Burr Millstones, Portable Mills, Smut Ma-es, Packers, Mill Picks, Water Wheels, Pulleys, and ing, specially adapted to Flour Mills. Send for

J. T. NOYE & SON, Buffalo, N. Y.



L. SMITH HOBART, President.

JOHN C. MOSS, Superintendent,

### RELIEF PLATES

For Newspaper, Book and Catalogue Illustrations, Engraved in Type-metal, by a new Photo-Chemical Method, from all kinds of Prints, Pen Drawings, Original Designs, Photographs, &c., much cheaper than Wood-cuts. These plates have a perfectly smooth printing surface, and the lines are as deep, as even and as sharp as they could possibly be cut by hand. We guarantee that they will print satisfactor ly on wet or dry paper, and on any press where type or wood-cuts can be so printed. Electrotypes may be made from them

Our Plates are now used by the principal publishers and manufac weers in every state in the Union.

SEND STAMP FOR ILLUSTRATED CIRCULAR.

Please say where you saw this

KNOW

A new Medical Treatise, "THE
SCIENCE OF LIFE, OR SELF-PRESERVATION," a book for everybody.

Price \$1, sent by mail. Fifty
original prescriptions, either one
of which is worth ten times the
Boston Herald says: "The Science of Life is beyond
all comparison, the most extraordinary work on Physiology
ever published." An Illustrated
Pamphlet sent FREE. Address
DR. W. H. PARKER, No. 4 THYSELF
Buildingh Street, Boston, Mass.

### MACHINISTS' TOOLS.

NEW AND IMPROVED PATTE Send for new illustrated catalogue.

Lathes, Planers, Drills, &c. NEW HAVEN MANUFACTURING CO., New Haven, Conn.

THE ACME FOOT LATHE. BACK Geared, Screw Cutting. Cuts from four to sixty-four threads. rice Eighty Dollars. Send for circular. POST & CO., Cincinnati, Ohio.

FOUNDRY AND MACHINE SHOP FOR Sale or Rent. We offer at a bargain, our old works, consist ng of three substantial brick buildings sheds, ample water power and facilities for conducting an iron or wood working business. Coal, iron, hard and soft Iumber close at hand. Three railroads. Address SOUTH BEND IRON WORKS, South Bend. Ind.

Tube Cleaners for cleaning Boiler tional Steel Tube Cleaner Co., 814 E 9th St., N. Y.

FOOT POWERTENONING MACHINES FOR SALE S. C. HILLS, 78 Chambers St., New York.

FORGINGS and SPECIAL MACHINERY, THE HULL & BELDEN CO. Danbury, Conn.

DAMPER REGULATORS BEST GAUGE COCKS.
MURRILL & KEIZER, 44 HOLLIDAY ST., BALTIMORE.

Working Models Experimental Machinery, Metal or Wood, made to by J. F. WERNER, 62 Centre St., N. Y.

## THE CHALMERS SPENCE CO., Foot East 9th St.,

"Indispensable to the Library, Clergyman, Lawyer, Physician, Editor, Teacher, Student, and all of any calling in tife who desire knowl-

## ENCYCLOPÆDIA BRITANNICA.

Ninth Edition .-- American Reprint. This great work is beyond comparison superior in its laborate and exhaustive character to all similar works. The contributors are the most distinguished and orignal thinkers and writers of the present-and of the ast.

This issue is the Ninth revision in a space of over one

This issue is the Ninth revision in a space of over one nundred years since its inception, and this reprint, a copy in every particular of the British Edition now in course of publication, is the best and ebsepest work ever offered to the American people.

The articles are written in a most attractive style and the quantity of matter in each volume is enerthird greater per volume than in any other Ordopædiasold at the same rates.

The work contains thousands of Engravings on Steel and Wood, and is printed from entirely new type made expressly for it.

It will be comprised in twenty-one Imperial octavo

expressly for it.

It will be comprised in twenty-one Imperial octavo volumes, six of which are now ready, and the succ eding volumes will be suced at the rate of three a year.

Sold only by subscription.

A neat Pamphlet, giving specimens of pages, cuts, full-vage flustrations, list of contributors, etc., will be mailed grafts to applicants.

J. M. STODDART & CO., Publishers, 723 Chestnut Street, Philadelphia.

H. H. KEY, Publisher, Room No. S. 120 Broadway, N. Y.



WOOD-WORKING MACHINERY. New and improved, far special work.
Boring Machines, Turning Lathes,
Saw Arbors, Saw Benches, Scroll
Saws, Panel Raisers, and other Wood
Tools. We built the only patented
Panel Raiser, with vertical spineles,
all others being infringements on
our patents of July II and October
31, 1671.

WALKER BROS. 73 and 75 Laurel St., Phila.

PERFECT

### **NEWSPAPER FILE**

The Koch Patent File, for preserving newspapers magazines, and pamphlets, has been recently improved and price reduces. Authorithers to the SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 by mail, or \$1.25 at one of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN." in git. Necessary for every one who wishes to preserve the paper.

MUNN & CO., Publishers SCIENTIFIC AMERICAN.

ant on Price List of

Superior Wood-Working Machinery allowed for the present. Also for Smith's Childed-Bean Visea, effective, heavy, strong, durable, and economical. For full particulars, address H. B. BMITH, Smithville, Burlington Co., N. J., U. S. A.

### THE TANITE CO. STROUDSBURG, PA EMERY WHEELS AND CRINDERS. GEO. PLACE, 131 Chambers St., New York Agent.

TORPEDO VESSELS. By Mr. DONALD TORPEDO VESSELS. BY MR. DONALD SON. A valuable paper, lately-read hefore the United Service Institute. Being a full exposition of the Tor-pedo-boat system, from the earliest smorts to the present time. Giving dimensions and performances of the several stress built by Thornycott Bros. for the various governments, highly, interesting triels of these boas, and experiences in war, and a describing of the torpe-does used. I illustration. Contained in SCIENTIFIC AMEICAN SUPPLEMENT NO. 79. Price 10 cents. To be had at this office and of all newspeeders.

### EUREKA SAFETY POWER!



Practically impossible to explode. Tested to 800 lbs. pressure per square inch. 2-Horse Power, \$150, 3 to 4 H. P., \$250. Also, Stationary Engines and boilers, and Spark Arresting Portable Engines for plantation use. Send for our circular. Discount to the trade.

B. W. PAYNE & SONS.

Corning, N. Y.

POINTS OF A GOOD HORSE. BEING the Report of the Committee appointed by the New England Agricultural Society to decide upon Rules for Guidance of Judges of Horses. The Points of Excellence. Size Color, Symmetry of Body, Head and Neck Eye and Ear, Feet and Limbs, fully described. Speed at the Trot, and in Walking, Style and Action. etc., with the percentage allowed for each quality. The Standard Driving Horses, Family Horses, Park or Pheton Horses, etc. An excellent Guide in Selecting animals. Contained in Scientifio American Supplement No. 193, price 10 cents. To be bad at this officeand of all newsdealers.

# H.W.JOHNS' PATENT.

Liquid Paints—all shades, fine t in the world.
Fire Proof Paint, for Wood work, &c.
Lood Paint, for Tin Roofs, Iron Work, &c.
Looding, with white Fire Proof Coating.
Looding, with white Fire Proof Coating.
Leaving Fire Proof Coating and Coating for Retorts, Furnaces, Leavy Roofs, &c.
Steam Pipe and Boiler Coverings.
Steam Packing, Asbestos Boards, Fire Proof
Coatings, Sheathings and Roofing Feirs, &c.
These articles are ready for use, and can be entire to the coating of the pipe for Samples, Pamphlets, Proof
Lists, &c.

H. W. JOHNS MANUFACTURING COMPAN

87 Maiden Lane, New York,
PHILADELPHIA BRANCH, 406 Arch St.
DOWNIE, TRAINER & CO., Boston,
S. W. HEMPSTED & CO., Columbus, Ohio.
M. BUCK & CO., St. Louis,
C. A. PARKER & CO., New Orleans,
THOMPSON & UPSON, San Francisco.

### 1872, 1874, 1875, SCIENCE RECORD.

A few copies of these splendid books are offered at the following very low prices. Among the subjects, the following are the most note-worthy, exhibiting in a condensed form a general ac-count of the Progress of the World:

CHEMISTRY AND METALLURGY,
MECHANES AND ENGINEERING,
ELECTRICITY, LIGHT, HEAT, SOUND,
TECHNOLOGY, THE USEFUL ARTS,
BOTANY AND HORTICULTURE,
AGRICULTURE,
RURAL AND HOUSEHOLD ECONOMY,
MATERIA MEDICA, THERAPEUTICS, HYGIENE,
NATURAL HISTORY AND ZOOLOGY,
METEOROLOGY, TERRESTRIAL PHYSICS,
GEOGRAPHY,
GEOLOGY, AND MINERALOGY,
METHONOMY,
BIOGRAPHY AND NECROLOGY.
BIOGRAPHY AND NECROLOGY.
BIOGRAPHY AND NECROLOGY.

Each yearly volume contains about 600 octavo pages, notuding a large number of handsome engravings. They are bound in substantial and handsome binding, and will be mailed on receipt of \$1.25 each. Address MUNN & CO., PUBLISHERS.

37 Park Row, New York city.

### THE Scientific American.

The Most Popular Scientific Paper in the World. THIRTY-SECOND YEAR.

Only \$3.20 a Year including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains six-teen 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.

All Classes of Readers find in The Scientific American a popular resume of the best scientific information of the day: and it is the sim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intell gent mind, this journal affords a constant supply of instructive reading. It is prometive of knowledge and progress in every community where it circulates.

Terms of Subscription .- One copy of THE SCIEN. TIFIC AMERICAN will be sent for one year - 52 numbers— postage prepaid, to any subscriber in the United States or Canada, on receipt of three dollars and twenty the publishers; six months, \$1.60; three months, \$1.00.

Clubs.-One extra copy of THE SCIENTIFIC AMERI-OAN will be supplied gratis for every club of five subscribers at \$3.20 each; a ditional copies at same proportionate rate. Postage prepaid.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT will be ent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of seven dollars by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. 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. 37 Park Row New York.

THE "Scientific American" is printed with CHAS.
ENEUJOHNSON & CO.'S INK. Temp and Lombard Sts., Philadelphia, and 59 Gold St., New York.