Mdvertisements.

ORDINARY RATES.

Inside Page, each insertion -- 75 cents a line Back Page, each insertion -- -- \$1.00 a line **For some classes of Advertisements, Special and Higher rates are required.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.



Star * Footpo ...cutting athes Automatic Cross feed

9 and 11-inch Swing. New and Original Features
Send for Catalogue B.
Seneca Falls Mfg. Company,
695 Water St., Seneca Falls. N. Y

AMERICAN PATENTS. - AN INTEResting and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31. 194. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 1002. Price 10 cents. To be had at this office and from all newsdealers

152 River St.. New Haven, Conn.

POWER & FOOT SMAPERS, PLANERS, DRILLS, LATHES MACHINE SHOP DUTETTS, TOOLS SAND SUPPLIES, CALLOOUS TRAIL SEBASTIAN LATHE CO. 170 CULVERT ST. CINCINNATI. O.

APART

in their size, use, and cost are the numerous implements described and illustrated in the wonderful "BOOK OF TOOLS." The vast variety will astonish you.



A BOOK OF TOOLS is the most complete catalogue ever issued. 550 pages and over 2,000 illustrations. Prices given.

A copy of this book sent, post-paid, to any address on receipt of 25 cents in stamps.

CHAS. A. STRELINGER & CO. Address Box 121/2, Adv. Dept. DETROIT, MICH.



BARNES' **> New Friction Disk Drill.**

FOR LIGHT WORK.

Has these Great Advantages:
The speed can be instantly changed from 0 to 1600 without stopping or shifting belts. Power spilled can be graduated to drive, with equal safety, the smallest or largest drills within its range—a wonderful economy in time and great saving in drill breakage. Send for catalogue.

W. F. & JNO. BARNES CO.,
1999 Ruby St., - Rockford, III.

Upright Drills and General Line of Machine

Shop Tools.

HILL, CLARKE & CO. 160 Oliver Street, BOSTON.

16 S. Canal St., Chicago.



THE COBURN PATENT TROLLEY TRACK **HOUSE DOOR** HANGERS_

> The first made with adjustable track. The track can be put up in 30 minutes.
>
> Send for Book.

The Coburn Trolley Track Mfg. Co., Holyoke, Mass.

Stark No. 4 Bench Lathe

with Automatic Turret Head

JOHN STARK

Send for catalog B.L. WALTHAM, MASS. Tuerk Bros., 35-45 West Randolph Street, Chicago, Ill. Chas. Churchill & Co. Ltd., 21 Cross Street, Finsbury, London. E. C., England.

PRATT'S CONE BELT SHIFTER

Simple in construction, easily applied. Saves TIME to manufacturers, TROUBLE to operator, and WEAR to belts. In ordering give width of belt. For Belts 1 to 2% inches wide, \$3.50 25% to 4 " 4.50

Send for catalogue of machinists' tool CHANDLER & FARQUHAR. 38 Federal St., BOSTON, MASS.

HALF A CENTURY OF CYCLES.—AN which well give you some information I present time. The first crank-driven bicycle. The present time. The first crank-driven bicycle. The HALF A CENTURY OF CYCLES.—AN interesting history of the cycle from its origin up to the present time. The first crank-driven bicycle. The "bone-shaker" and its successors. The tricycle. The modern wheel. Cycle building a science. Points of improvement. The nonematic tire. A hand and foot cycle. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1401.2. Price flocents. To be had atthis office and from all newsdealers.



97 PATTERN
S.0011 sets in use.
Indorsed by the leading carriage builders.
Reduces frection 75 per oct. Can be put on old or new work.
Write for our Rustrated Catalogue and Testimo, which we send free on application. Imperial Balling Ayle Bent 184.190 [Jec Start.] nials, which we send free on application. Imperial Ball Bearing Axle Dept., 184-190 Lake Street, Chicago, !!!





Antifriction Axles

Send for Catalogue.

for Vehicles

THE RUBBER TIRE WHEEL CO., P. O. Box 546. SPRINGFIELD, OHIO

GOLD OR SILVER

ores can be crusbed more economically by our patented **STEAM STAMP** than by any other method. Do You KNOW that in firstcost, operation, transportation, monthly repaire, time spent in installing, WE CAN SAVE YOU MONEY. Prospectors and capitalists write CATES IRON WORKS, CHICACO

COILS AND BENDS

Iron, Brass and Copper Pipe



NICKEL Electro-Plating Apparatus and Material THE Hanson & Van Winkle

Newnris, N. J. 136 Liberty St., N. Y. 35 & 37 S. Canal St., Chicago.

Krueger's Automatic Self-Register ing Lumber Measure

Saves Time and Mental Wear and Tear. Avoids costly mistakes measuring lumber. Being exact, it prevents controversies over invoices between huyer and seiler. Does away with all slow methods. Kasy to understand and operate. One trial couvinces of its value.

If you want the best CHUCKS, buy Westcott's



Combination Lathe Chucks, Plain Universal Lathe Chucks, Plain Universal Lathe Chucks, Plain Universal Lathe Chucks, Indevendent Lathe Chucks, Made by Westcott Chuck Co., Uncida, N. J. J. S. A. Ask for catalogue in English, French, Spanish or German, Filest Prize at Columbian Exposition, 1-33.

ROCK DRILLS AIR COMPRESSORS SIMPLEST, MOST EFFICIENT and DURABLE. RAND DRILL CO.

Send for Catalogue.

100 Broadway, New York.

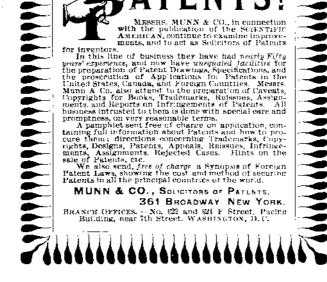


Experimental & Model Work



THE IOHNSTOWN SPECIALTY CO., Johnstown, Pa.





WILL YOU START A LAUNDRY? "The Columbia" Modern Laundry



Is the Cheapest and Best.

EDGE TOOLSare often nearly ruined by using a grind-stone not adapted to the work. Our quarries produce a large variety of grits suitable for grinding any tool.

What was send you our Catalogue,



TURBINE WATER WHEELS.
SEND FOR PAMPHLET.
JAMES LEFFEL & CO.,
Springfield, Obio, U. S. A.

ZENTMAYER'S • MICROSCOPES

211 South Eleventh St. Phila., Pa. HYPNOTISM
Sixty ways, \$5; my method, \$2.
100 page book, 10c. Occult Forces,
30c. Prof. Anderson, S. A. 27, Masonic Temple, Chicago



THE MODERN ICE YACHT. -Geo. W. Polk. A new and valuable paper, containing full, practical directions and specifications for the construction of the fastest and best kinds of fec Yachts of the latest, most approved forms. Illustrated with enravinus drawn to scale showing the form, position, and arrangement of all the parts. Contained in Scientific American Supplement, No. 6124. Price 10 cents. 'To be had at this office and of all newsdealers,



MECHANICAL ...DRAWING

Architectural Drawing: Electricity; Mechanics: Architecture; Plumbing. Mining; Civil Engineering in all Branches; Steam Engineering (Loco., Stat'y. and Marine). The International Correspondence Schools



To Machinists, Pattern Makers, Carpenters, Steam Engineers, Draughtsmen, Steam Fitters, Electrical Workers, Civil Engineers, Piumbers, Miners, References Derpohers, Free Circular, State Subject you wish to Study, State Subject you wish to Study, State Subject you wish to Study.

DYNAMO AND MOTOR CASTINGS and ELECTRICAL SUPPLIES **TELEPHONES** STEAM AND CAS ENCINE CASTINGS SEND STAMP FOR CATALOG-

PALMER BROS., Mianus, Conn

ELECTRO MOTOR, SIMPLE, HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised 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 latheor any machine requiring not over one man blower. With lingures Contained in SCINNTIFIC AMERICAN SUPPLEMENT. No. 641. Price 10 cents. To be had at this office and from all dewedealers.

GREENFIELD Steam Engine Works.

Established 1874. Manufacturers of Greenfield Sta-tionary, Portable and Yacht

ENGINES AND BOILERS.

Also Horizontal, Automatic and Variable Cut-off Engines. Size from 3 to 73 Horse-Fowr. Also Vertical and Horizontal and Marine Boilers, Steam Pumps and Adams' Grate Bars.

W. G. & G. GREENFIELD. East Newark, N. J.

THE ORNAMENTAL IRON INDUStry.—Description of the method of manufacturing wrought iron into ornamental and artistic forms, With silustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. 1020. Price 10 cents. To be had at this office and from all newsdealers.

GAS and **GASOLINE** ENGINES.

Using Natural Gas, Coal Gas, Producer Gas, and Gasoline direct from the tank. 1 to 40 H. P., actual.

The Springfield
Gas Engine Co
21 W. Washington St
Springfield, O.





for \$150, less 10z discount for cash. Built on interchangeable plan. Built of best material. Made in lots of 10z therefore we can make the price. Boxed for shipmont, weight 502 pounds. Made for Gasor Gasoriae.

137 Write for Special Catalogue. WEBSTER M'F'G CO., 1074 West 15th Street, CHICAGO.

POWER? POWER?? POWER!!!

Fifty per cent. increase at additional expense.

Victor Vapor Engine.

Emphatically the Twentieth Century Gas Engine. Send stamp for catalogue "A" Reliable agents wanted. THOMAS KANE & CO.

The Chicago Gas & Gasoline Engine



The simplest gas and gasoline engine on the market. Has no equal for absolute, steady speed and durability. It is a dwarf in size and a Samson in strength. Catalogue sent on application.

MANUFACTURED BY

J. J. NORMAN CO...
48 "A" South Clinton St., CHICAGO, II.L.



Engineers should be regular readers of the

Scientific American,

Every issue contains information of great value to them. It is a weekly chronicle of all happenings of importance to engineers—mechanical or otherwise New inventions in machinery, for any purpose, are duly recorded and explained in its pages. No engineer should miss a single issue, for there is not a publication in the world that gives so much valuable information on mechanical and scientific matters.

Its price puts it within the reach of all. \$3.00 yearly, \$1.50 half yearly, \$1.00 for four months. Send check, draft, express or money order navable to

MUNN & CO., Publishers, 361 Broadway, New York City.

