

Advertisements.

Back Page - - - - - \$1.00 a line.
Inside Page - - - - - 75 cents a line.
Engravings may head advertisements at the same rate
over line, by measurement, as the letter press. Ad-
vertisements must be received at publication office as
early as Friday morning to appear in next issue.

The Tanite Co.,

STROUDSBURG, PA.

EMERY WHEELS & GRINDERS

CHICAGO OR WESTERN HEAD QUARTERS
for Tanite Co.'s Emery Wheels, Grinding
Machinery, &c. C. C. CHAMPLIN, 152 Lake St.
Tanite Wheels delivered free of freight in any part
of the West, on receipt of list price in advance.

Portland and Keene's Cement.

From the best London Manufacturers. For sale by
JAMES BRAND, 85 Beekman St., New York.
A Practical Treatise on Cement furnished for 25 cents.

SCHLENKER'S

Stationary-Die and Revolving-Die

Bolt Cutters.

THE BEST AND CHEAPEST MADE.
HOWARD IRON WORKS,
Buffalo, N. Y.
Send for Catalogue.

FOR SALE—BORING MILL, TURN
11 ft., \$2,250; 30 in. Radial Drill, Back geared, \$275;
Combined Punch and Shear, \$900; 18 in. 34 ft. Planer, \$250—
all new. 32 in. 8 ft. Planer, \$550; 35 in. 16 1/2 ft. Lathe,
\$450, 2d hand—at SHEARMAN'S MACHINERY DEPOT,
309 Arch Street, Philadelphia, Pa.

MANUFACTURING
SPECIALTIES IN HARDWARE.
We have unusually complete facilities for manufacturing
Promptly, Economically and Well,
almost anything—however large or small—in any metal.
Correspondence with models solicited.
THE HULL & BRIDEN CO.,
DANBURY, CONN.

LATHE DOGS, EXPANDING MANDRELS, STEEL
Clamps, &c., for Machinists. Manufactured by C. W.
LECOUNT, So. Norwalk, Ct. Send for reduced Price List.

BOGARDUS' PATENT UNIVERSAL ECEN-
TRIC MILLS—For grinding Bones, Oreg. Sand, Old
Crucibles, Fire Clay, Gunpowder, Oil Cake, Feed, Corn,
Corn and Cob, Tobacco, Spuff, Sugar, Salts, Roots,
Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica,
etc., and whatever cannot be ground by other mills.
Also for Paints, Printers' Inks, Paste Blacking, etc.
JOHN W. THOMPSON, successor to JAMES BOGAR-
DUS, corner of White and Elm Sts., New York.



[ESTABLISHED 1846.]

Munn & Co.'s Patent Offices.

The Oldest Agency for Soliciting Patents in the
United States.

THIRTY YEARS' EXPERIENCE.

MORE PATENTS have been secured through this
agency, at home and abroad, than through any other in
the world.

They employ as their assistants a corps of the most ex-
perienced men as examiners, specification writers, and
draftsmen that can be found, many of whom have been
selected from the ranks of the Patent Office.

SIXTY THOUSAND inventors have availed them-
selves of Munn & Co.'s services in examining their in-
ventions and procuring their patents.

MUNN & CO., in connection with the publication of
the SCIENTIFIC AMERICAN, continue to examine in-
ventions, confer with inventors, prepare drawings, spe-
cifications, and assignments, attend to filing applications
in the Patent Office, paying the government fees, and
watch each case step by step while pending before the ex-
aminer. This is done through their branch office, corner
F and 7th streets, Washington. They also prepare and
file caveats, procure design patents, trademarks, and re-
issues, attend to rejected cases (prepared by the inventor
or other attorneys), procure copyrights, attend to inter-
ferences, give written opinions on matters of infringe-
ment, furnish copies of patents, and, in fact, attend to
every branch of patent business both in this and in for-
eign countries.

A special notice is made in the SCIENTIFIC AMERI-
CAN of all inventions patented through this agency, with
the name and residence of the patentee. Patents are of-
ten sold, in part or whole, to persons attracted to the in-
vention by such notice.

Patents obtained in Canada, England, France, Belgium,
Germany, Russia, Prussia, Spain, Portugal, the British
Colonies, and all other countries where patents are
granted, at prices greatly reduced from former rates.
Send for pamphlet pertaining specially to foreign patents,
which states the cost, time granted, and the requirements
of each country.

Copies of Patents.

Persons desiring any patent issued from 1836 to Novem-
ber 26, 1867, can be supplied with official copies at rea-
sonable 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 of-
fice \$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 the laws and full directions for
obtaining United States patents sent free. A hand-
somer bound Reference Book, gilt edges, contains 140
pages and many engravings and tables important to every
patentee and mechanic, and is a useful handbook of re-
ference for everybody. Price 25 cents, mailed free.

Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, N. Y.

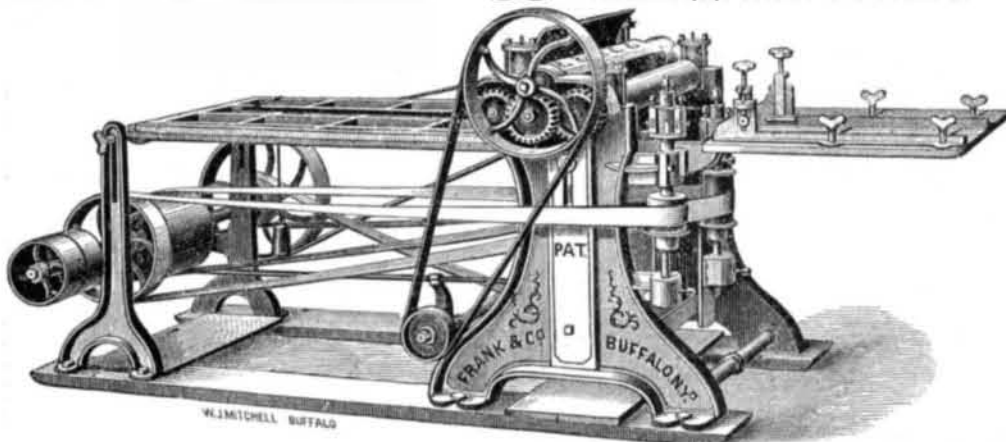
BRANCH OFFICE—Corner F and 7th Streets, Wash-
ington, D. C.

Economist Planer & Matcher.

This is the lowest-priced Planer and Matcher
in the market. It is also easier operated, and
runs with less power, requiring only from 4 to 5
horse power to plane and match hard or soft
lumber. It can be changed from a planer and
matcher to a surfacer in one minute. The
right hand matcher head spindle runs in bear-
ings cast on the frame, and is outside of the
full width the planer will plane, and saves the
necessity of removing the right hand guides to
surface the full width of the planer head.
The adjustable or left hand matcher spindle
does not come above the planer bed, conse-
quently does not have to be lowered when the
matcher head is removed for surfacing. The
chip breaker is weighted, and gives a uniform
pressure either with a light or heavy cut. The
cutter-head bearings have patent self-oiling
bearings. The lower ends of matcher spindles
run in our patent self-oiling steps, and are
equal to the best in use. The loose pulley on
back countershaft has C. Purdy's patent self-
oiling loose pulley cure, which will hold oil
for from one to two months. Every part of
the planer can be reached for adjustment with-
out getting into or under it. The price of this
planer is so low that it is within the reach of
any one in want of a planer and matcher. For
small country towns, or to use in sawmills
where a moderate amount of planing is re-
quired, it is equal, if not superior, to a heavy
high-priced machine.

We have sold 160 of these planers within the last 20 months, all of which are giving good satisfaction. We build two sizes, to surface 20 and 24 in. wide, and tongue and groove from 14 to 18 in. wide, and surface from 1/4 to 3/4 in. thick, at prices varying from \$250 to \$325. For further information, address

FRANK & CO., Manufacturers of Wood-Working Machinery,
No. 176 Terrace Street, Buffalo, N. Y.



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



REYNOLDS & CO.,
145 EAST ST., NEW HAVEN, CT.,
MANUFACTURE

Iron and Steel Set Screws, Round, Square, and Hexagon
Head; Machine and Cap Screws; Piano, Knob, and Lock
Screws; Machine, Bridge, and Roof Bolts; Bolt Ends,
Blanks, Nuts, Washers, etc., of every description.
Send for Price List.

Brayton Ready Motor.

It has no boiler, is safe, economical, started by any
one in one minute, occupies small space, and gives an
unsurpassed steady, reliable power. Address

Penna. Ready Motor Co.,
132 N. 3d St., Philadelphia, Pa.



The BEST MILLSTONE DRESSER—GRISCOM
& Co., Manufacturers and Patentees, Pottsville, Pa.

FOR THE LATEST IMPROVED
MACHINERY,
For Manufacturing SPOKES, HANDLES, AND HUBS,
Address J. GLEASON, cor. 2d & Diamond Sts., Phila.

ROOTS' PATENT PORTABLE FORGE.



THE ONLY FORGE WITH FORCE BLAST BLOWER.

THE ONLY EFFECTIVE FORGE MADE.

P. H. & F. M. ROOTS, Manuf'rs, CONNERSVILLE, IND.

S. S. TOWNSEND, Gen'l Ag't, 31 Liberty St., NEW YORK.

ROGERS' TANNATE OF SODA BOILER

SCALE PREVENTIVE.

JOS. G. ROGERS & CO., Madison, Ind.
Send for book on Boiler Incrustation.

M. SELIG JUNIOR, & CO.,
Importers of American Machinery, Tools, Agricultural
Implements, Wholesale and Export Hardware and Ma-
chinery Merchants. Est'd 1866. 85 Queen Victoria St.,
LONDON, E. C., ENGLAND.

Diamonds & Carbon

shaped or Crude, furnished and set for Boring Rocks,
Dressing Mill Burrs, Emery Wheels, Grindstones, Hard-
ened Steel, Calender Rollers, and for Sawing, Turning, or
Working Stone and other hard substances; also Glaziers'
Diamonds. J. DICKINSON, 64 Nassau St., New York.

LEHIGH UNIVERSITY—TUITION FREE.
Civil, Mechanical and Mining Engineering; Chemis-
try and Metallurgy; A Classical Course; French and Ger-
man; English Literature; International and Constitu-
tional Law; Psychology and Christian Evidences. Address
The REV. JOHN M. LEAVITT, D.D., Pres., Bethlehem, Pa.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa.
The attention of Engineers and Architects is called to
our improved Wrought-Iron Beams and Girders (pat-
ented), in which the compound welds between the stem
and flanges, which have proved so objectionable in the
mode of manufacturing, are entirely avoided. We are pre-
pared to furnish all sizes at terms as favorable as can be
obtained elsewhere. For descriptive lithograph, address
Carnegie Brothers & Co., Union Iron Mills, Pittsburgh, Pa.

GENUINE CONCORD AXLES

The Standard—Best Stock—Finest Finish—
MANUFACTURED ONLY BY

D. ARTHUR BROWN & CO. Fishersville, N.H.

Machinists' Tools.

New and Improved PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

PORTLAND CEMENT

For Walls, Cisterns, Foundations, Stables, Cellars,
Bridges, Reservoirs, Breweries, etc.
Remit 10 cents for Practical Treatise on Cements.
S. L. MERCHANT & Co., 76 South St. New York

Niagara
Steam Pump Works
ESTABLISHED 1826.
CHARLES B. HARDICK,
No. 23 Adams Street,
BROOKLYN, N. Y.

\$16 FORGES,
FOR YOUR SHOP.
Send 3c. stamp for catalogue to EMPIRE PORTABLE
FORGE CO., Troy, N. Y.

THE CENTENNIAL INTERNATIONAL EX-
HIBITION OF 1876.—The full History and Progress of
the buildings, news and accounts of all the most notable
objects are given weekly in the SCIENTIFIC AMERI-
CAN SUPPLEMENT. Terms, \$5 for the year; single co-
pies 10 cts. To be had at this office, and of all news agents.
All the back numbers, from the commencement on Janu-
ary 1, 1876, can be had. Those who desire to possess a
complete and splendid illustrated Record of the Centen-
nial Exposition, should have the SCIENTIFIC AMERI-
CAN SUPPLEMENT.

EAGLE FOOT LATHES,

With Scroll and Circular Saw Attach-
ments, Slide Rest, Tools, &c.; also Small
Engine Lathes, Metal Hand Planers, &c.
Neatest designs, superior finish. Low
Prices. Our new Catalogue describes
these and every tool necessary for the Am-
ateur or Artisan. Send for it.
WM. L. CHASE & CO.
95 & 97 Liberty St. New York.

WHIPPLE'S

Patent Door Knob.

Awarded a Bronze Medal at the American Institute Fair
for 1874. The Judges say: "We consider this method of
fastening DOOR KNOBS a great improvement over any-
thing yet invented for the purpose, as it obviates the use
of side screws and washers, and can be regulated to suit
any thickness of Doors." Send for Circular.
THE PARKER & WHIPPLE COMPANY,
West Meriden, Conn., or 97 Chambers St., N. Y.

SNYDER'S LITTLE GIANT STEAM ENGINE



PERFECT
NEWSPAPER FILE.

The Koch Patent File, for preserving newspapers,
magazines, and pamphlets, has been recently improved
and price reduced. Subscribers to the SCIENTIFIC AM-
ERICAN 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.

NON-COMBUSTIBLE STEAM BOILER & PIPE

COVERING

WITH "AIR SPACE" IMPROVEMENT.
Saves 10 to 20 per cent. CHALMERS SPENCE CO.,
Foot E. 9th St., N. Y.; 1202 N. 2nd St., St. Louis, Mo.

DAMPER AND LEVER
REGULATORS **BEST** GAGE COCKS.
MURRILL & KEIZER, 44 Holliday St., Balt.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

NOYE'S
Mill Furnishing Works
are the largest in the United States. They make Burr
Millstones, Portable Mills, Smut Machines, Packers, Mill
Picks, Water Wheels, Pulleys and Gearing, specially
adapted to flour mills. Send for Catalogue.
J. T. NOYE & SON, Buffalo, N. Y.



OF THE
SCIENTIFIC AMERICAN,
FOR 1876.

THE MOST POPULAR SCIENTIFIC PAPER
IN THE WORLD.

THIRTY-FIRST YEAR.

VOLUME XXXIV.—NEW SERIES.

The publishers of the SCIENTIFIC AMERICAN
beg to announce that on the first day of January,
1876, a new volume commenced. It will continue
to be the aim of the publishers to render the con-
tents of the new volume more attractive and use-
ful than any of its predecessors.

To the Mechanic and Manufacturer.

No person engaged in any of the mechanical pur-
suits should think of doing without the SCIENTIFIC
AMERICAN. Every number contains from
six to ten engravings of new machines and inven-
tions which cannot be found in any other publica-
tion.

The SCIENTIFIC AMERICAN is devoted to the
interests of Popular Science, the Mechanic Arts,
Manufactures, Inventions, Agriculture, Commerce
and the industrial pursuits generally; and it is val-
uable and instructive not only in the Workshop
and Manufactory, but also in the Household, the
Library, and the Reading Room. Each volume
contains hundreds of Notes, Receipts, and Sugges-
tions and Advice, by Practical Writers, for Work-
ing Men and Employers, in all the various arts.

TERMS OF SUBSCRIPTION—POSTAGE
PAID BY US.

One copy Scientific American, one year ..\$3 20
One copy Scientific American, six months. 1.60
One copy Scientific American, three months 1.00
One copy Scientific American and one copy
Scientific American Supplement, both
for one year, post-paid..... 7.00

The Scientific American Supplement
A weekly paper, uniform in size with the SCIENTIFIC
AMERICAN, but a distinct publication. It
contains working drawings of engineering works,
and elaborate treatises on every branch of Science
and Mechanics, by eminent writers, at home and
abroad. An illustrated cover protects the hand-
somer printed sheets. Price, \$5.00 per annum.
Single copies 10 cents.

Remit by postal order, draft, or express.
Address all letters and make all Post Office or-
ders and drafts payable to

MUNN & CO.
37 PARK ROW, NEW YORK.

The "Scientific American" is printed with
CHAS. ENEU JOHNSON & CO.'SINK Tenth and
Lombard-sts., Philadelphia, and 50 Gold-st., New-York.