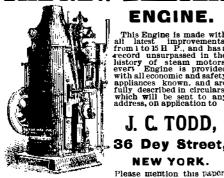
THE NEW BAXTER



ENGINE.

This Engine is made with all latest improvements, from 1 to 15 H. P., and has a record unsurpassed in the listory of steam motore, every Engine is provided with all economic and safety appliances known, and are fully described in circulars, which will be sent to any address, on application to

J. C. TODD, 36 Dey Street, NEW YORK.

NOTICE.

We are prepared to furnish the finest quality of THROUGH PUNCHES and DIES

for Metal Work, for the manufacture of which we have unequalled facilities.

In ordering, give Length of Punch and Size of Shank that can be used in Press Thickness and Width of Die; Template of exact size of Punchings wanted.

HENRY DISSTON & SONS, Incorporated, JOBBING DEPARTMENT, FRONT & LAUREL STREETS, PHILADELPHIA, PA.



SHIELDS & BROWN CO.



Steam, Gas and Water Pipes, Drums, Heaters, etc. The Best Non-Conductor of Heat & Cold in the World. escriptive Circul Send for illustrated desc 143 Worth Street, rcular, and name this paper. 78 and 80 Lake St., CHICACO. NEW YORK.



BIBB'S Celebrated Original BALTIMORE ACE HEATERS

umical Coal Stoves in the world B. C. BIBB & SON love Founders, Baltimure, Ed MARBLEIZED SLATE MANTELS New and Beautiful Designs



STEAM ENGINES.

Horizontal and Vertical.

Dredging Machinery, Flour, Powder, Slate and Flint Mill Machinery, Tur-bine Water Wheels,

MESSRS, MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

for inventors.

In this line of business they have had forty-on-years' experience, and now have unequaled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms

A pamblet sent free of charge on application, con-

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, free of charge, a Synopsis of Foreign Patent aws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,

361 Broadway, New York. BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It soes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN. When selecting a list of publications in waten you decide it is for your interest to advertise. This is frequently done, for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

For rates see top of first column of this page, or address

MUNN & CO., Publishers,

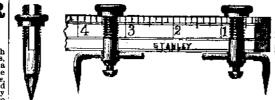
MUNN & CO., Publishers,

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

WEAK, NERVOUS PEOPLE



DR.W.J. HORNE, INVENTOR, 191 WARASH AV., CHICACO.



TELESCOPIC OBJECTIVES AND MIR-rors. Their preparation and testing.—By H. Grubu, F. R. S. An interesting description of the processes now employed in the construction of telescopic objectives, prefaced with a short history of the manufacture of glass. Contained in SCIENTIFIC AMERICAN SUPPLE-MENTS, Nos. 548 and 549. Price, illocats each. To be obtained at this office or from any newsdealer.

USED AND RECOMMENDED by Meissonier, Kaul-BACH, VON PILOTY, GAB. MAX, and the most eminent artists throughout the world. The

Johann Faber Siberian Lead Pencils. None genuine unless stamped Johann Faber. For sale by all stationers and dealers in Artists' Materials.

QUEEN & CO., PHILADELPHIA, General Agents for the U.S.



CHANDLER & FARQUHAR 177 Washington St. BOSTON.

New England Agents for RARNES' FOOI POWER MACHINERY AND DEALERS IN Machinists' Supplies of Every Kind

Send two stamps for illus. catalogue

DIPHTHERIA. — A PAPER BY DR DIPHTHEMIA. — A PAPER BI DR. Carl Bunsen, giving the results of his microscopical researches into the cause, origin and propagation of this dread disease. With 9 figures. Contained in SCIENTIFIC AMBRICAN SUPPLEMENT, No. 607. Price 16 cents. To be had at this office and from all newsdealers.

Antomatic Engines a Specialty

Pennsylvania Agricultural Works, York, Pa.



Address A. B. FARQUHAR & SON, York, Pa. Send for Large Illustrated Catalogue,

Encyclopedia of pedia of pool Engrav Diamond Drills and Lightning ings of WELL Machines.

Book free, 25c. for mailing it. American Well Well. Machines.

RULE TRAMMEL POINTS. They can be attached to Folding Rules of any ordinary width; and on many kinds of work will take the place of regular Trammel Peints, Calipers or Dividers. A complete set consists of two Brass Trammel Heads, with movable Steel Points, and one Head with a Pencil Socket, Price, per set of three, in a box......50 cents. STANLEY RULE & LEVEL CO., NEW BRITAIN, CONN. Sold by all Hardware Dealers.

> **ROCK DRILLS** AIR COMPRESSORS, BOILERS, HOISTS,

> > GENERAL MINING MACHINERY. Send for Illustrated Catalogue

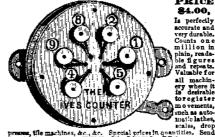
Ingersoll Rock Drill Co. 10 PARK PLACE, N. Y.

THE MODERN ICE YACHT.—BY Geo. W. Polk. A new and valuable paper, containing full practical directions and specifications for the construction of the fastest and best kinds of Ice Yachts of the latest, must approved forms. Illustrated with engravings drawn to scale, showing the form, position, and arrangement of all the parts. Contained in Scientific American Supplement, No. 624. Price 10 TIFIC AMERICAN SUPPLEMENT, No. 624. Price cents. To be had at this office and of all news dealers.



STEAM PUMPS for Hot or Cold, Fresh or tha, Tar, for Cane Juice, Liquors, Syrups, Scum; for Ammonia, Alk lies, Extracts, Acids; for Thick, Volatile, Viscous or Foul Liquids, etc. Vacuum Pumps of the highest efficiency. Filter Press Pumps. Air, Gas and Acid Blowers. Air Compressors. Etc. BUILT BY GUILD & GABRISON, Brooklyn, N. Y.





presses, tile machines, &c., &c. Special prices in quantities. Send for clouds. Address GFO. E. IVES, Mfc.. Box 1975, B79 State St., New Mayon, Cunts.



WEITMYER PATENT FURNACE BOILERS OF EVERY DESCRIPTION.

IDE Automatic Engines, Traction and Portable Engines STEAM ROAD ROLLERS. Manufactured by Foundry and Machine Department, Harrisburg, Pa., U. S. A.



HARRISON CONVEYOR!

Handling Grain, Coal, Sand, Clay, Tan B.rk, CInders, Ores, Seeds, &c. Send for BORDEN, SELLECK & CO., Sole Manu'f ers, Chicago, IIL

AMMONIA SULPHATE.—A PAPER by Watson Smith, F.C.S. describing Gruneberg's apparatus and process for making su phate of ammonia. With 3 figures. Contained in SCI ENTIFIC AMERICAN SUPPLEMENT, No. 566. Price 10 cents. To be had at this office and from all newsdealers.

Telegraph and Electrical SUPPLIES
Medical Ratteres. Inventors' Models, Experimental Work, and fine brass castings. Send for ratalogue C. E. JONES & BKO. Cincinnati, O. lits important to us that was mention this paper.

Square, Oval, or Round Smooth Holes. For carpenter, cabinet Holes. For carpenter, cabinet, and pattern work, Min. 50c., set \$4.00, mailed free. Bridgeport Gun Implement Co., 17 Maiden Lane, N. Y.

₹ New Catalogue of Valuable Papers

contained in Scientific American Supplement, sent free of charge to any address. MUNN & CO.. 361 Broadway, N. Y.

EXCELLENT BLACK COPIES of anything written or drawn with any Pen (or Type Writer) by the Patent AUTOCOPYIST Lithography. Specimens Free. AUTOCOPYIST CO., 165 William Street, New York.



by mail, postpaid, if you will send us only 50 cts. in postage or a Postal Note. This includes Ink, &c., complete. Also your NAME. BUSINESS and ADDRESS ON THE STAMP. Call or address CONVOLLY Paper,
Etc.
Only 50 Cents: Rochester, N. Y.

CONOLLY The Rubber Man.



Eight Light Dynamo

As illustrated in Sci. Am. of April 23 and 30, 1887, and in Sci. Am. Supplement, July 2, 1887. Complete Machines or Castings furnished, also Wire for the same.

Address W. S. BISHOP, 95 GRAND AVE., New Haven, Conn.

PNEUMATIC DYNAMITE TORPEDO Gun.—An exhaustive account of this new weapon and of the experiments made with it; along with a description and illustration of a proposed dynamite cruiser. with 6 figures. Contained in SCIENTIFICAMERICAN SUPPLEMENT, NO. 593. Price 10 cents. To be had at this office and from all newsdealers.



BRASS WORK Models & Small Brass Work a specialty.
Satisfaction Guaranteed.
T. L. McKEEN,
Easton, Pennsylvania.

THE COPYING PAD.—HOW TO MAKE

by which the copies are made; now to apply the written letter to the pad; how to take off copies of the letter-Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 43%. Price 10 cents. For sale at this office and by all newsdealers in all parts of the country.



MACHINERY PALACE OF THE PARIS Exhibition of 1889.—Description of the main railery of the machinery Palace, and of the 362% foot trusses which are to be used in its construction. With 2 engravings. Contained in Scientific American Supplement No. 594. Price 10 cents. To be had at this office and from all newsdealers gravings. Contained in SCIEN PLEMENT, No. 594. Price 10 office and from all newsdealers.

STEAM PUMPS FOR ALL PURPOSES. Bend for new illustrated Catalogue. Hall Steam Pump Co., 91 LIBERTY ŠT.,

New York.

SHAFTING DEPARTMENT Couplings, Hangers, Shafting, Pulleys. UUUµIIII65, IIdii6CIS, Jildi IIII6, FUIICYS.
SEND FOR CATALOGUE.
Salesroom

Of the Electrical Accumulator Co.
Dynamos, Motors, Lamps, Batteries, and General Electrical Supplies.
Electro-Dynamic Company, 224 Carter St., Philadelphia. EDISON MACHINE WORKS.



FOOT POWER

SCROLL SAWS! Lathes, Mortisers, &c. FOR Workshop USE Sold on Trial, if desired. New Catalogue free. Seneca Falls Mfg. Co., 666 Water Street,

SENECA FALLS, N. Y.

SEVERN AND MERSEY TUNNELS.-Full description of these two important engineering works, with two engravings. Contained in SCIENTIFIC AMERICAN SUPPLIAMENT, No. 604. Price 10 cents. To be had at this office and from all newsdealers.



ARTESIAN

catalogue.
Pierce Well Excavator Co.
New York.

WATCHMAN'S IMPROVED TIME DETECTOR,



Patented 1875, 1876, 1877, 1880, 1881, 1882, This instrument

and Perfect Instrument. Sens 17.

Box 375.

E. IMHAUSER, 206 Broadway, New York

PANAMA CANAL.—A PAPER BY DR. W. Nelson on some of the difficulties to be overcome in the prosecution of this work. Damming the Chagres River. Extent of the earth cutting. Ocean tides. The climate. Prevalent diseases. Cost of the canal in lives. Cost of the work. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 603. Price 10 cents. To be had at this office and from all newsdealers.



TABASHEER RELATION OF TO MIN. TABASHEER, KEDATION OF TO MINI-eral Substances.—An account of a curious substance secreted by the bamboo. Its physical properties and chemical composition. and its appearance under the microscope. With one figure. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 595. Price 10 cents. To be had at this office and from all newsdealers.

Two-Horse Power Engine. \$75.



WITH STEEL BOILER, \$150. Cheap, Reliable, Safe.

Automatic Boller Feed. Automatic Pop Safety Valve, Steel Boiler. Cost of runing guaranteed not to exceed three cents per hour. Nothing equal to it ever before offered for the price. Larger sizes equally low. Se for free descriptive circular. CHAS. P. WILLARD & CO 236 Randolph Street, Chicago, Ill.

NOTES ON THE PANAMA CANAL.—A paper by R. N. Boyd, M. Inst. C. E., describing the present condition of the work on the Panama Canal, and discussing the question as to the time it will take to complete the work at the present rate of progress. Illustrated with a map. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 596. Price III cents. To be had at this office and from all newsdealers.



The most successful Lubricator for Loose Pulleys in use, VAN DUZEN'S PATENT LOOSE PULLEY OILER. Highly recommended by those who have used them for the past two years. Prices very reasonable. Every user of machinery should have our "Catalogue No. 55;" sent free. VAN DUZEN & TIFT, Cincinnati. O

CIL. SELECTRIC LICHT Est Plain or Colored LANTERN SLIDES. L. J. MARCY, 1604 CHESTNUT ST., PHILADELPHIA SCIENTIFIC BOOK CATALOGUE.

RECENTLY PUBLISHED. Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.

MUNN & CO., Publishers Scientific American, 361 Broadway, New York.

FAC-SIMILE copies obtained to an unlimited extent in indelible black by the copying apparatus, equal to the finest lithographic work, Specimens free.

FELIX F. DAUS & Co., 21 Beekman Street, New York.

TO AMERICAN MANUFACTURERS Wishing to open business with India please send price lists of real aluminum gold jewellery, and all sorts of fancy goods, curiosities, and latest novelties, scientific instruments, and toys, etc., to M. KANK & COM-PANY, 134 Kalkadevo Road, Bombay.

100 PER PROFIT & SAMPLES FREE to men canvassers for Dr. Scott's es, etc. Lady agents wanted for Electric Carsets, Ouick sales, Write at once for terms. Dr. Scott, 842 B'way, N. Y.



ELECTRIC LIGHT AND

System of Arc and Incandescent Lighting. Direct or in connection with the Storage Batteries of the Electrical Accumulator Co. mos. Motors, Lamps, Batteries, and General Elec-