

# SCIENTIFIC AMERICAN

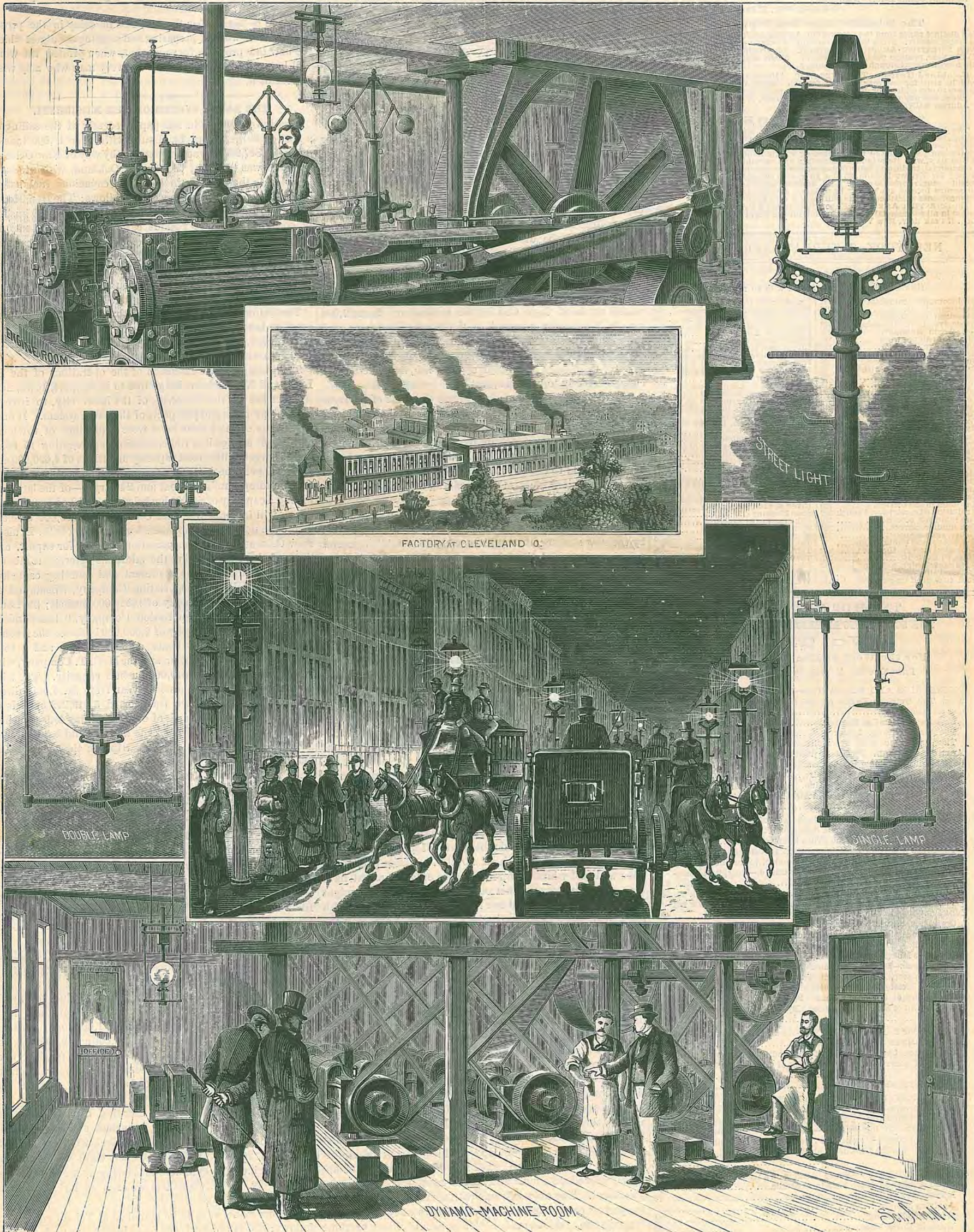
[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLIV.—No. 14.  
[NEW SERIES.]

NEW YORK, APRIL 2, 1881.

[\$3.20 per Annum.  
[POSTAGE PREPAID.]



THE BRUSH ELECTRIC LIGHT STATION.—STREET ILLUMINATION IN NEW YORK.—[See page. 211.]

AMERICAN INDUSTRIES.—No. 69.

THE BRUSH ELECTRIC LIGHT.

The most difficult problems in electric lighting have been: (1). To provide an efficient and economical means of converting mechanical power into electric energy, that is, a good dynamo-electric machine. (2). To devise a generator able to evolve an electric current capable of subdivision, to supply a series of lamps in one circuit. (3). To invent a self-regulating lamp adapted to such an electric circuit, and so constructed that any accidental disturbance of it, or its extinction, would have no effect upon the other lamps in the same circuit. The lamp to be at the same time easy to keep in order, durable, and economical in power. (4). To discover an automatic method of regulating the supply of electricity so that the current would be always exactly equal to the varying requirements of the circuit. Up to 1876, when Mr. Brush produced his first dynamo-electric machine, a large number of scientific investigators and mechanical inventors had been at work upon these problems. Individually and together they had accomplished much, but there was yet no machine that could be considered a commercial success, and no lamp—certainly no system of electric lighting—that had passed beyond an experimentally promising stage. There was no machine that could furnish a current for a number of lamps, much less sustain them in one circuit with steadiness and uniformity.

Very soon after Mr. Brush entered the field, he presented to the public an apparatus which was free from the defects of all other systems, and the public, waiting for just such an apparatus, welcomed the new machine, and the result is that to-day the Brush Electric Light is practically the sole occupant of the field; at least forty-nine out of every fifty lights that have been sold in this country being Brush lights. Up to the present time over 6,000 Brush lights have been sold for regular industrial use, and the business has only just opened. An idea of the great superiority of the Brush system of lighting may be obtained from the fact that with the largest sized Brush machine forty powerful electric lights are burned in one circuit, with an absorption in the machine of thirty-six horse power. We believe that no other system of lighting can maintain one-fifth of this number of lights on one circuit; and most are confined to a single light to one machine.

Although the Brush electric light has been introduced on an extended scale in other cities, it is only recently that it has been brought to the city of New York; but notwithstanding the tardiness of its appearance here, it is being largely introduced and used by both private individuals and the public.

Our large illustration represents the lighting station of the Brush Electric Illuminating Company of New York, at 133 and 135 West 25th street, and also shows a portion of Broadway between 14th and 34th streets, as it appears at night illuminated by twenty-one Brush electric lights.

In the same illustration we give a view of the immense factory of the Brush Electric Company at Cleveland, Ohio; also views of some of the lamps. The parent company at Cleveland controls the manufacture and sale of all of Mr. Brush's patented inventions relating to electric light or electro-plating apparatus and supplies.

The genius of the inventor of this system, and the energy and good business management of the Brush Light Electric Company of Cleveland, have done more since 1876 to place the business of illumination by the electric light upon a practical and substantial basis than has been done in this direction by all other inventors since the discovery by Faraday, at least so far as voltaic arc lights are concerned.

In every sense the Brush electric light is a practical, commercial success, and is no longer an experiment. No better

proof of this could be required than the well known fact that no one can buy a Brush machine or lamp at less than regular prices. Makers of other machines may offer inducements of every kind, in the way of large discounts from regular prices, the privilege of a trial with no obligation to purchase, long deferred payments, etc., etc.; but the Brush Company takes the same ground held by George H. Corliss in regard to engines, and claims that the apparatus they furnish is no longer experimental, that it is well worth the price asked for it, and should not be compared with merely experimental systems whose principal recommendations are

250 lights in parks, docks, and summer resorts; 275 lights in railroad depots and shops; 150 lights in mines, smelting works, etc.; 380 lights in factories and establishments of various kinds; 1,500 lights in lighting stations, for city lighting, etc.; 1,200 lights in England and other foreign countries. A total of over 6,000 lights which are actually sold, none of them being on trial.

This system, we believe, is the only one by which a large number of powerful electric lights can be burned in series, upon a single circuit of wire, with steadiness and uniformity. The machine known as No. 8 maintains forty lights of

2,000 candle power each, upon a circuit ten miles in length of copper wire No. 6 English gauge. By using still larger wire the distance or length of circuit may be proportionately increased, it being possible to extend the circuit to twenty-five miles by using No. 1 wire. The smaller sizes of Brush machines are fully as efficient. A No. 7 machine is used in Montreal to light the harbor on a circuit of about three miles, using sixteen lights. Another peculiarity and advantage possessed by the system is that any number of lights desired, from one up to the number capable of being maintained by the machine, can be burned in circuit from the machine without changing its speed or adjusting the lamps.

Each lamp of the Brush type is provided with an automatic cut-out, which is one

of the valuable features of the system. If from any cause a lamp in circuit becomes deranged so that its carbons do not feed together properly, or if the carbons need renewing, the cut-out mechanism is called into action and this particular lamp is switched out of circuit without disturbing any other lamp in use. When this lamp has been supplied with carbons again and put in order it will burn as before. This simple cut-out mechanism effectually guards against all the dangers of general extinction of lights, a thing liable to occur in all other systems. We believe that no other system uses a cut-out.

When it becomes desirable to operate lamps more than seven or eight hours continuously, the double lamp shown in our large illustration is used, and two sets of carbons are employed. Both carbon rods are actuated by a single magnet, the same as that employed in a single lamp, and they are so arranged that when one set of carbons is completely consumed, the other set is automatically switched into circuit.

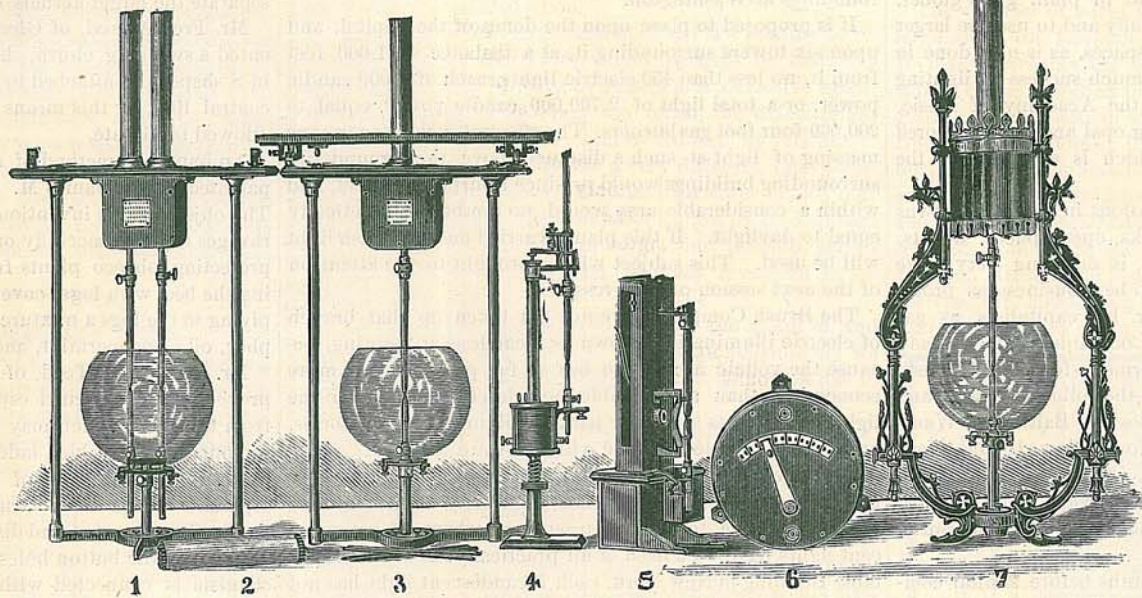
In practice the transfer of the voltaic arc from one set of carbons to the other is instantaneous and scarcely noticeable. By means of these double lamps a system of lights may be maintained in continuous operation from fourteen to sixteen hours without requiring any attention, whereas other systems are limited to six or eight hours' continuous burning.

The great simplicity and durability of the machines are points of importance in considering the wear and tear from constant use. The experience of the four years shows that one per cent allowance for wear and tear is ample to cover, and that with even a less amount annually spent upon the machines they will last indefinitely.

The business of the Brush light on Manhattan Island is in the hands of the Brush Electric Illuminating Company of New York, a corporation organized under the laws of the State, with a capital of \$1,000,000. The officers

are: W. L. Strong, President; A. D. Juilliard, Vice President; A. A. Hayes, Jr., Secretary; S. B. Sturges, Treasurer; C. M. Rowley, General Manager; R. J. Sheehy, Superintendent.

The first lighting station of the company is at Nos. 133 and 135 West 25th street. It contains at present five dynamo-electric machines, the largest of which is 89 inches long, 28 inches wide, and 36 inches in height, and weighs 4,800 pounds, and runs at a speed of about 700 revolutions per minute. It is believed to be the largest machine in the

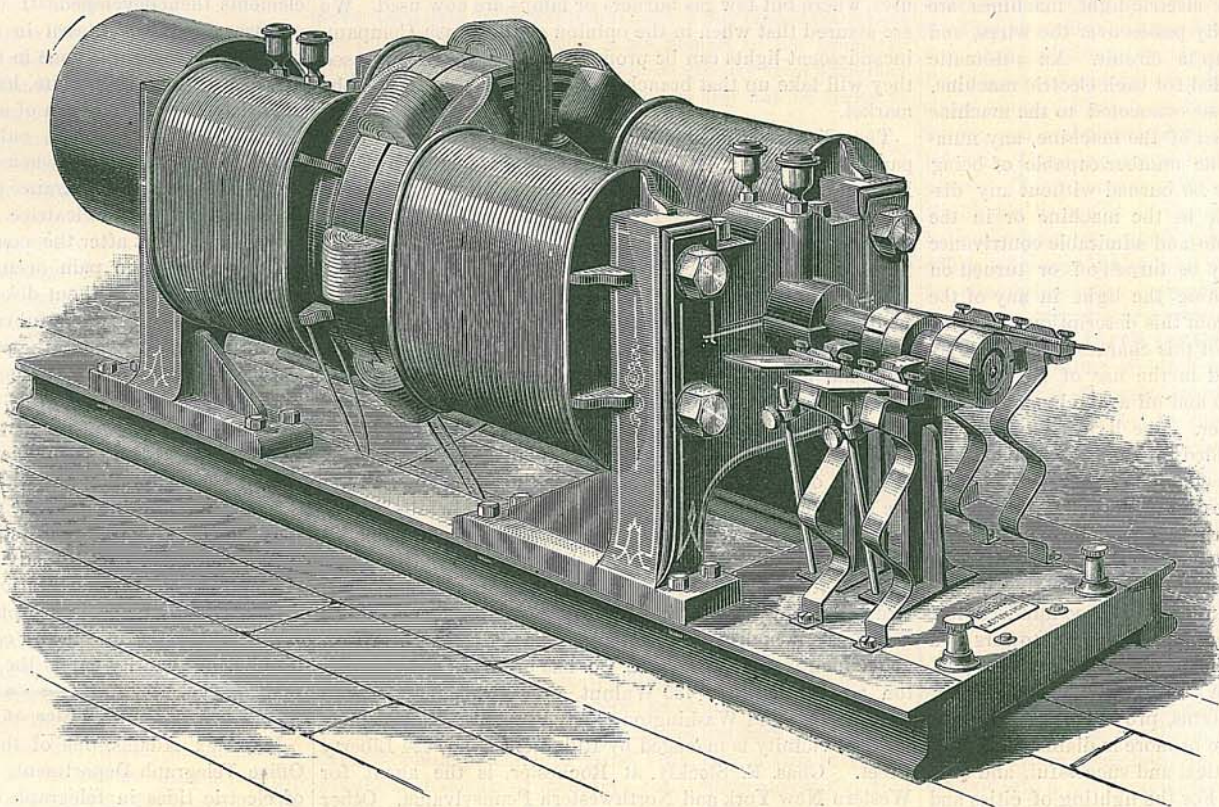


1. Double Lamp.—2. Carbons.—3. Single Lamp.—4. Focusing Lamp.—5. Head-light Lamp.—6. Dial Attachment to Machine.—7. Ornamental Lamp.

BRUSH ELECTRIC LAMPS.

that they can be bought at the purchaser's own price, and may be returned if not satisfactory.

Not only has the Brush light practically monopolized the field in this country, but, if we may judge from reports, it is also rapidly doing the same abroad. It has made wonderful advances in England, where it is controlled by the Anglo-American Brush Electric Light Corporation, Limited, having a capital of \$4,000,000. One year ago this company bought the English patents of Mr. Brush at a very large price, and we understand they have recently purchased all his other foreign patents—those for France, Belgium, Austria, Russia, Italy, Spain, Norway, Sweden, Denmark, etc., paying for them still larger prices than they paid for the English patents, and they now propose to commence the introduction of the Brush light into all these countries in the same business-like and thorough manner which has characterized its management from the first. The sums paid for these foreign patents are, it is claimed, greater



BRUSH DYNAMO-ELECTRIC MACHINE.

than have ever been paid for any other foreign patents obtained by an American. As rapidly as arrangements can be made the Brush light is being introduced into every civilized country on the globe, and it seems to have found a field in every branch of industry, and in almost every imaginable situation, as the following partial list of users indicates:

There are 800 lights in rolling mills, steel works, shops, etc.; 1,240 lights in woolen, cotton, linen, silk, and other factories; 425 lights in large stores, hotels, churches, etc.;


are: W. L. Strong, President; A. D. Juilliard, Vice President; A. A. Hayes, Jr., Secretary; S. B. Sturges, Treasurer; C. M. Rowley, General Manager; R. J. Sheehy, Superintendent.

The first lighting station of the company is at Nos. 133 and 135 West 25th street. It contains at present five dynamo-electric machines, the largest of which is 89 inches long, 28 inches wide, and 36 inches in height, and weighs 4,800 pounds, and runs at a speed of about 700 revolutions per minute. It is believed to be the largest machine in the

**THE**  
**New York Ice Machine Company,**  
 21 Courtland St., New York, Rooms 54, 55.  
**LOW PRESSURE BINARY ABSORPTION SYSTEM.**  
 Machines Making  
**ICE AND COLD AIR.**  
 Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

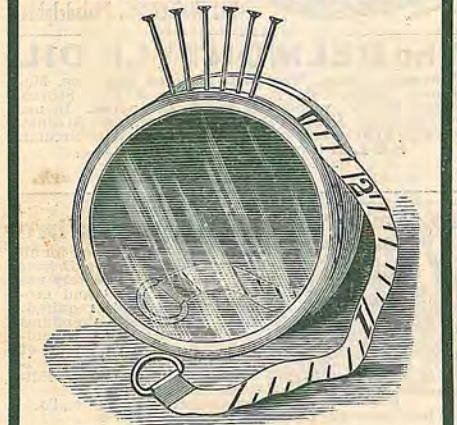
**THE BACKUS**  
  
**WATER MOTOR**  
 SUPPLIES FROM HYDRANT PRESSURE the cheapest power known. Invaluable for blowing Church Organs, running Printing Presses, Sewing Machines in Households, Turning Lathes, Scroll Saws, Grindstones, Coffee Mills, Sausage Machines, Feed Cutters, Electric Lights, Elevators, etc. It needs little room, no firing up, fuel, ashes, repairs, engineer, explosion, or delay, no extra insurance, no coal bills. Is noiseless, neat, compact, steady; will work at any pressure of water above 15 lb.; at 40 lb. pressure has 4-horse power, and capacity up to 10 horse power. Prices from \$15 to \$275. Send for circular to THE BACKUS WATER MOTOR CO Newark N. J.

**DROP HAMMERS.**  
 STILES & PARKER PRESS CO., Middletown, Conn.  
**COVERING**  
 For Steam Pipes, Boilers, and Water Pipes. Applied, Removed, and Replaced by any one, without injury. No dust—no dirt. Send for circular. J. A. LOCKE & SON, 40 Cortlandt Street, N. Y.

Established 1844.  
  
**JOSEPH C. TODD,**  
 Successor to TODD & RAFFERTY,  
**PATERSON, N. J.,**  
 Engineer and Machinist.  
 Flax, Hemp, Jute, Rope, Oakum, and Bagging Machinery. Steam Engines, Boilers, etc. Sole Agent for Mayher's New Patent Acme Steam Engine and Force Pumps combined. Also owner and exclusive manufacturer of

**THE NEW**  
**Baxter Patent Portable Steam Engine.**  
 These engines are admirably adapted to all kinds of light power for driving printing presses, pumping water, sawing wood, grinding coffee, ginning cotton, and all kinds of agricultural and mechanical purposes, and are furnished at the following low prices:  
 1 Horse Power, \$150    1 1/2 Horse Power, \$190  
 2 Horse Power, 245    2 1/2 Horse Power, 275  
 3 Horse Power, 290    4 Horse Power, 350  
 Send for descriptive circular. Address  
**J. O. TODD,**  
**PATERSON, N. J.**  
 Or No. 10 Barclay St., New York.

**H.W. JOHNS'**  
**ASBESTOS**  
 LIQUID PAINTS, ROOFING,  
 Steam Pipe & Boiler Coverings, Steam Packing,  
 Mill Board, Sheathing, Fire Proof Coatings, &c.  
 H. W. JOHNS M'FG CO. 87 MAIDEN LANE, N. Y.

**THE**  
**HOWARD MANUFACTURING CO.**  
 Manufacture and Introduce  
**Patented Novelties**  
 AND  
**YANKEE NOTIONS.**  
**THE LATEST NOVELTY.**  
  
 Mirror, Pin Cushion and Tape Measure.  
**PRICE 25 CENTS.**  
 Sample by mail on receipt of price. A liberal discount to the trade.  
**HOWARD MANUFACTURING CO.,**  
 Box 2295, New York.

**SAWS 40,000 SAWS**  
 EMERSON'S ILLUSTRATED SAWYER'S HAND BOOKS  
 TO ANY PART OF THE WORLD.  
 FULLY ILLUSTRATED. ADDRESS EMERSON, SMITH & CO.  
 BEAVER FALLS, PA.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 50 Gold St. New York.

**THE NEW PULSOMETER**  
**CHEAP, ECONOMICAL, EFFICIENT.**  
 NATIONAL LINE, PIER No. 39, NORTH RIVER,  
 Foot of Houston St.,  
 New York, March 3, 1881.  
 PULSOMETER STEAM PUMP CO.:  
 We have had one of your No. 7 New Pulsometers in use for about three months at this pier, pumping out the coffer dam while under the stern of the steamship "Holland," and have found it to be all you claim for economy and simplicity. I would specially recommend the New Pulsometer to those requiring a steam pump. Yours respectfully,  
 GEO. L. ANDREWS, Wharfinger.

**UNIVERSAL INJECTORS.**  
 SCHUTTE & GOHRING, Sole Manfrs.  
 Philadelphia Office, 12th & Thompson Sts.,  
 NEW YORK, - - - A. ALLER, 109 Liberty Street.  
 BOSTON, - - - A. F. UPTON, 7 Oliver Street.

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

FOR BEST  
**GOLD PENS.**  
 Send for Price List to  
 JOHN HOLLAND, Mfr., 19 West 4th St., Cincinnati.

**NEW YORK BELTING AND PACKING**  
**OUR "TEST" HOSE**  
 Is superior to anything ever before made. Every description of Rubber Hose always in stock.  
 37 & 38 PARK ROW, NEW YORK.

**ENGRAVING.**  
 Attention is requested to the superior facilities of this Company for doing engraving for Catalogues, Price Lists, Books, and Commercial work of every description, at prices lower than by any other method. Send three-cent stamp for Illustrated Circular.  
 N. Y. PHOTO-ENGRAVING CO. 67 & 69 Park Place, New-York.  
 Philadelphia, No. 125 Chestnut St. Chicago, No. 3 Tribune Building

**Jarvis Furnace Co.**  
 Patent Setting for Steam Boilers, Burns' Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 42 East 23d St., New York; No. 709 Market St., St. Louis; No. 18 Second St., Baltimore.  
**\$72 A WEEK.** \$12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

**THE LITTLE WONDER**  
 IN THE MECHANIC ARTS.  
  
 and Shaped Diamond Carbon Points, indispensable for Truing Porcelain, Hardened Steel, Chilled Iron, and Paper Calender Rolls. Practical Mechanics and Paper Makers using them pronounce them a marvel of the age, for efficiency and durability, doing that which no steel tool can do. After turning the rolls, when inspected by a microscope, there is no perceptible wear. They are now extensively used in Rolling and Paper Mills, both in this country and in Europe. Send stamp for circular to JOHN DICKINSON, 64 Nassau Street, New York.

**PREVENT SLIPPING.** The handsomest, as well as the safest Carriage Step made. Forged from best iron, and formed with a sunken panel, in which is secured a plating of richly moulded rubber. Durability warranted. Send for illustrated circular. Rubber Step M'fg Co., Boston, Mass.

**FRIEDMANN'S PATENT INJECTOR.**  
 THE BEST  
**Boiler Feeder**  
 IN THE WORLD.  
 Simple, Reliable, and Effective.  
**40,000 IN ACTUAL USE.**  
**NATHAN & DREYFUS,**  
 Sole Manufacturers, NEW YORK.  
 Send for Descriptive Catalogue

**"BUCKEYE" LAWN MOWER.**  
 The lightest and easiest running MOWER ever made.  
 STRICTLY FIRST CLASS.  
**M. ST. FOOS & CO.,**  
 Springfield, Ohio.  
 Send for catalogue.

**Racine & Boat** **A REVOLUTION IN BOAT BUILDING.**  
 For 25c. will mail section showing construction. Catalogue gratis.  
**THOMAS KANE & CO., Chicago, Ill.**

**Mill Stones and Corn Mills.**  
 We 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 & SONS, Buffalo, N. Y.**

**SHAFTS PULLEYS HANGERS**  
 At Low Prices. Large Assorted Stock.  
**A. & F. BROWN, 57-61 Lewis St., New York.**

**The Asbestos Packing Co.,**  
 Miners and Manufacturers of Asbestos,  
**BOSTON, MASS.,**  
 OFFER FOR SALE:  
 PATENTED ASBESTOS ROPE PACKING.  
 " " " LOOSE " "  
 " " " JOURNAL " "  
 " " " WICK " "  
 " " " MILL BOARD " "  
 " " " SHEATHING PAPER " "  
 " " " FLOORING FELT " "  
 " " " CLOTH " "

**BOILER COVERINGS.**  
 Plastic Cement and Hair Felt, with or without the Patent "AIR SPACE" Method.  
**ASBESTOS MATERIALS,**  
 Made from pure Italian Asbestos, in fiber, mill board, and round packing. **THE CHALMERS-SPENCE CO.,** 40 John Street, and Foot of E. 9th Street, New York.

**Columbia Bicycle.**  
 A permanent, practical road vehicle, whose graceful model and elegant appearance excite universal admiration. It is carefully finished, and confidently guaranteed as the best value for the money to be attained in a bicycle. Send 3c. stamp for 24 page catalogue with price lists and full information.  
**THE POPE MFG. CO.,**  
 597 Washington St.,  
 BOSTON, MASS.

**ICE AT \$1.00 PER TON.**  
**PICTET ARTIFICIAL ICE CO., Limited,**  
 P. O. Box 2083, 142 Greenwich St., New York.  
 Guaranteed to be the most efficient and economical of all existing Ice and Cold Air Machines.

**ROOFING.**  
 For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.  
**ASBESTOS FELTING WORKS,** 80 Cortland St., New York. Steam Pipe and Boiler Covering, Hair Felt, Roofing, Roofing Materials, Building Paper and Paints.

**WIRE ROPE**  
 Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York. Wheels and Rope for conveying power long distances. Send for circular.

**CATALOGUED.**

THE FOLLOWING MANUFACTURERS ARE PROMINENT IN THEIR RESPECTIVE LINES; IN SHORT, ARE HEADQUARTERS:

**WIRE ROPE**  
**THE HAZARD MANUFACTURING CO.,**  
 C. M. THOMPSON, Agt. 87 Liberty St., N. Y.

**PLUMBING & SANITARY GOODS**  
 OF ALL KINDS.  
**THE J. L. MOTT IRON WORKS,**  
 Nos. 88 and 90 Beekman St., - New York.

**HOISTING ENGINES.**  
**COPELAND & BACON,**  
 NEW YORK.

**THE DEANE STEAM PUMP.**  
**DEANE STEAM PUMP COMPANY,**  
 New York, Holyoke, Mass., Boston.

**MECHANICAL BOOKS.**  
 Send 10 cents for 96-page Catalogue of Books for Machinists and Engineers.  
**D. VAN NOSTRAND, 23 Murray St., New York.**

**WATER TUBE STEAM BOILERS.**  
**HABCOCK & WILCOX, Engineers,**  
 30 Courtland St., - - - New York.

**WHEEL BARROWS.** Our Bolted is superior to any made. Builders, Contractors need them. \$24.00 doz. Address A. B. COHU, 197 Water St., New York.

**BRADLEY'S CUSHIONED HAMMER**  
 Approaches the nearest to the action of the Smith's arm of any Hammer in the World.  
**BRADLEY & COMPANY, Syracuse, N. Y.**

**Esterbrook's Steel Pens**  
 Are the most popular pens in use.  
 Works, Camden, N. J. 26 John St., New York.

**CELEBRATED "RED STRIP" BELTING, RUBBER BELTING, PACKING, AND HOSE.**  
**THE GUTTA PERCHA AND RUBBER M'FG CO.,**  
 23 Park Place, New York.

**VALVES AND FIRE HYDRANTS.**  
**THE LUDLOW VALVE M'FG CO.,**  
 Troy, N. Y.

**PATENT SAFETY JEWEL CASE**  
 Having Double Lock. Can be made fast to dressing case or trunk. Lined with silk satin, velvet. Beautifully finished. 4 sizes, \$6, \$8, \$10, \$12. Sent C. O. D. Frothingham & Emery, 20 Vesey St., N. Y.

**BOLT CUTTERS and SCREW CUTTING MACHINES.**  
**HOWARD IRON WORKS,**  
 BUFFALO, N. Y.

**FAIRBANKS' STANDARD SCALES.**  
 Manufactured for every department of trade. The CHEAPEST SCALE manufactured, quality considered. THE LARGEST SCALE FACTORY IN THE WORLD.

**AIR ENGINES AND ELEVATORS.**  
**SHERRILL ROPER AIR ENGINE CO.,**  
 91 & 93 Washington St., - New York.

**REMINGTON AGRICULTURAL CO.,**  
 57 Reade St., New York.  
 Manufacturers of the Remington Mower, Lion Wheel Horse Rake, Steel and Carbon Plows, Cultivators, Shovels, Hoes, Rakes, Forks, etc., etc.

**ROCK DRILLS & AIR COMPRESSORS.**  
**INGERSOLL ROCK DRILL CO.,**  
 1 1-2 Park Place, - - - New York.

**Lehigh Valley**  
**EMERY WHEEL CO.,** - Weissport, Pa.

**FILES, DRILLS, CHUCKS, VISES,**  
 TAPS, REAMERS, STUB TOOLS, &c., &c.  
**GOODNOW & WIGHTMAN, Boston, Mass.**

**Metaline and Star Roller Bush Tackle Blocks, &c.**  
**BAGNALL & LOUD,**  
 Boston, Mass., and 33 South Street, New York.

Established **EAGLE ANVILS.** 1843.  
 Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.  
**DOUBLE SCREW, PARALLEL, LEG VISES.**  
 Made and WARRANTED stronger than any other Vise by **FISHER & NORRIS** only, Trenton, N. J.

**BUY BARBER'S BIT BRACE**

**Brass Cocks, Valves, and Fittings.**  
**McNAB & HARLAN MAN'G CO.,**  
 56 John Street, - - - New York.

**EXETER MACHINE WORKS,**  
 Manufacturers of  
 Steam Engines, Blowers, and  
 Steam Heating Apparatus.  
 50 Federal St., Boston, Mass.

**DADDOW & BEADLE'S**  
**MINER'S PAT. SQUIBS for BLASTING.**  
 Mfd. by Miners' Supply Co., St. Clair, Sch'li Co., Pa.

**MILES BRO. & CO.,**  
 Manufacturer **BRUSHES** of every description,  
 102 FULTON ST., NEW YORK.

**The Greatest Rock Breaker on Earth.**  
 Capacity, a ton a minute. All kinds of Mining Machinery. Send for circulars. **GATES & SCOVILLE IRON WORKS,** Chicago, Ill.

**STEARNS SAW MILLS.**  
 Saw Mill Machines, Boilers, and Engines.  
**STEARNS MANUFACTURING COMPANY, Erie, Pa.**

**PRINTING INKS.**  
 The leading Periodicals, including the SCIENTIFIC AMERICAN, are printed with our inks.  
**G. MATHER'S SONS, 60 John St., New York.**