

Advertisements.

Inside Page, each insertion... Back Page each insertion... The above are charges per a line...

To Business Men.

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...

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

LEPAGE'S THE ONLY GENUINE LIQUID GLUE

UNEQUALLED FOR CEMENTING wood, glass, china, paper, leather, etc. Always ready for use.

THE ECLIPSE OF ALGOL, WITH THE latest Determinations of its Distance and Dimensions. By Royal B. Hill.

BARREL, KEQ, AND STAVE MACHINERY. Over 50 varieties manufactured by E. & B. Holmes, Buffalo, N. Y.

ARMATURES.—A PAPER BY R. FUGE describing the usual method of winding armatures. With 7 figures.

COPPER TUBES SHEET BRASS WIRE. Mention this paper.

COMPRESSED AIR FOR TRAMWAYS.—A paper by Norman Selfe, discussing the comparative merits of compressed air under high and low pressures.

PRICE REDUCED. ASBESTOS ROOFING. FIRE AND WATER-PROOF BUILDING FELT, FIRE-PROOF PAINTS, STEAM PACKINGS, BOILER COVERINGS, ETC.

ON STEAM BOILERS.—A LECTURE BY J. M. Allen, delivered in the Sibley College course.



PATENTS.

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.



PHOTOGRAPHIC PRINTS OF MACHINERY ON PERMANENT BROMIDE PAPER give all the finest gradations of shadow, from clear white to the purest black.

ELECTRIC LEATHER BEEFING. BEST and most RELIABLE for wiff running. Chas. A. Schieren & Co.

TELESCOPIC OBJECTIVES AND MIRRORS. Their preparation and testing. By H. Grubb, F. R. S.

TO MANUFACTURERS, PATENTEES OR CONTRACTORS. Estimates will be given and contracts made by the Household Sewing Machine Co.

THE INVENTION OF MACHINES.—A paper by Prof. Hale Shaw, pointing out what is necessary for the foundation of a science of the invention of machines.

ROCK BREAKERS AND ORE CRUSHERS. We manufacture and supply at short notice and lowest rates, Stone and Ore Crushers.

CARBOLIC ACID.—AN INTERESTING paper by Frank French, M.D., treating of the history of carbolic acid, the mode of manufacturing it, and its uses as a therapeutic agent.

AIR PUMP, AN INEXPENSIVE.—BY G. M. Hopkins. Directions for making an efficient air pump for both exhaustion and compression.

MODEL and EXPERIMENTAL WORK. Send for Circulars. E. Jones & Bro.

CAPILLARY ATTRACTION.—AN INTERESTING paper by William Thomson, discussing the question whether the attraction between any particle of matter in one body and any particle of matter in another continues to vary inversely as the square of the distance.

INFORMATION For Users of Steam Pumps. Van Duzen's Patent Steam Pump is the best in the world.

AIR PURIFICATION OF.—BY D. PRINCE, M.D. An experimental study in relation to the removal from the air of the dust or particles of matter supposed to produce yellow fever.

RICE AUTOMATIC CUT-OFF ENGINE. Self-Contained. Sensitive Governor. Balanced Valve. High Speeds.

THE JOHN T. NOYE MFG. CO., BUFFALO, N. Y.

THE GREAT AQUEDUCT OF NEW YORK CITY.—Lengthy and very complete account of the great aqueduct now being built by the city of New York.

ROSE POLYTECHNIC INSTITUTE, TERRE HAUTE, IND. A School of Engineering. Well endowed, well equipped department of Mechanical and Civil Engineering.

THE ARC ELECTRIC LIGHT.—A RECENT address before the New York Electric Light Association by Leo Duff.

THE JOHN T. NOYE MFG. CO., BUFFALO, N. Y.

The Original Unvulcanized Packing CALLED THE STANDARD—As it is the Packing by which all others are compared.

PATENT JACKET KETTLES, Plain or Porcelain Lined. Tested to 100 lb. pressure. Send for Lists.

THE GREAT AQUEDUCT OF NEW YORK CITY.—Lengthy and very complete account of the great aqueduct now being built by the city of New York.

TIGHT & SLACK BARREL MACHINERY. A SPECIALTY. JOHN GREENWOOD & CO. ROYALTON, N.Y.

A SYNOPSIS OF ALL THE KNOWN Anesthetics, with their physical and physiological properties, and anesthetic value.

ROSE POLYTECHNIC INSTITUTE, TERRE HAUTE, IND. A School of Engineering. Well endowed, well equipped department of Mechanical and Civil Engineering.

THE ARC ELECTRIC LIGHT.—A RECENT address before the New York Electric Light Association by Leo Duff.

EPPS'S GRATEFUL-COMFORTING. COCOA

ROCK BREAKERS AND ORE CRUSHERS. We manufacture and supply at short notice and lowest rates, Stone and Ore Crushers.

CARBOLIC ACID.—AN INTERESTING paper by Frank French, M.D., treating of the history of carbolic acid, the mode of manufacturing it, and its uses as a therapeutic agent.

AIR PUMP, AN INEXPENSIVE.—BY G. M. Hopkins. Directions for making an efficient air pump for both exhaustion and compression.

MODEL and EXPERIMENTAL WORK. Send for Circulars. E. Jones & Bro.

CAPILLARY ATTRACTION.—AN INTERESTING paper by William Thomson, discussing the question whether the attraction between any particle of matter in one body and any particle of matter in another continues to vary inversely as the square of the distance.

INFORMATION For Users of Steam Pumps. Van Duzen's Patent Steam Pump is the best in the world.

AIR PURIFICATION OF.—BY D. PRINCE, M.D. An experimental study in relation to the removal from the air of the dust or particles of matter supposed to produce yellow fever.

RICE AUTOMATIC CUT-OFF ENGINE. Self-Contained. Sensitive Governor. Balanced Valve. High Speeds.

THE JOHN T. NOYE MFG. CO., BUFFALO, N. Y.

THE GREAT AQUEDUCT OF NEW YORK CITY.—Lengthy and very complete account of the great aqueduct now being built by the city of New York.

ROSE POLYTECHNIC INSTITUTE, TERRE HAUTE, IND. A School of Engineering. Well endowed, well equipped department of Mechanical and Civil Engineering.

THE ARC ELECTRIC LIGHT.—A RECENT address before the New York Electric Light Association by Leo Duff.

EPPS'S GRATEFUL-COMFORTING. COCOA

ROCK BREAKERS AND ORE CRUSHERS. We manufacture and supply at short notice and lowest rates, Stone and Ore Crushers.

CARBOLIC ACID.—AN INTERESTING paper by Frank French, M.D., treating of the history of carbolic acid, the mode of manufacturing it, and its uses as a therapeutic agent.

THE AMERICAN BELL TELEPHONE CO. 95 MILK ST BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use.

THE Scientific American Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

Architects, Builders, and Owners will find this work valuable in furnishing fresh and useful suggestions. All who contemplate building or improving homes or erecting structures of any kind, have before them in this work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newdealers.

MUNN & CO., Publishers, 361 Broadway, New York. Building Plans and Specifications.

In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish Plans and Specifications for Buildings of every kind, including Public Buildings, Churches, Schools, Stores, Dwellings, Carriage Houses, Barns, etc.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address MUNN & CO., 361 Broadway, New York.

PRINTING INKS. THE "Scientific American" is printed with CHAS. T. RENEY JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.