is replete with two hundred illustrations, many of which are reproductions of the best work by prominent amateur and professional photographers. There are articles on the applications of photography to science, such as a photographic record of sound analysis by Professor William Hallock, astronomical photography and photogrammetry and telephotography by Albert Gleaves of the U.S. A., and descriptions, with illustrations, of many useful pieces of apparatus, besides an abundance of the latest formulas for developers and lenses. It is a book of much value to the photographer desirous of keeping up with the

THE WONDERS OF MODERN MECHANISM. A Resumé of Recent Progress in Mechanical, Physical and Engineering Science. By Charles Henry Cochrane. Philadelphia: J. B. Lippincott Company. 1896. Pp. 402. Price \$2. No index.

In this work we find presented in popular form the achievements of engineers in the many departments of science, such as building, manufacture of steel, electricity, artificial refrigerating and similar topics. Naturale subject is treated somewhat superficially, and perhaps forthat reason is all the better adapted for the senda copy of the above interesting book free to all who readers it is desired to reach. It is quite profusely illustrated and in many ways is really notable as being thoroughly up to date. Whatever serious value it has would have been immensely enhanced by an index.

The Scientific African.—The Scientific African is the name of a new journal, the first copy of which has just been received. Phonetically it might easily be confounded with the Scientific American, but the resemblance really ends there. Still this paper gives promise of a very useful existence as an exponent of South African science and technology. It is published monthly at Cape Town, Africa. The industries of South Africa are daily increasing in number and importance, and the new journal is pledged to foster these industries by illustrating and describing the various methods now in use, so as to increase the number and improve the quality of African manufactures. In addition to this, pure science is not to be neglected, as is seen by the notes on natural history, geology, anthropology, medicine and chemistry which appear in the first number. We welcome it to the brotherhood of scientific jour-

# SCIENTIFIC AMERICAN

## BUILDING EDITION.

JANUARY, 1896.-(No. 123.)

TABLE OF CONTENTS.

- 1. A residence at Orange, N. J. Two perspective eleva tions and floor plans, also an interior view. Approximate cost \$12,000. Mr. Frank W. Beall, Chicago, Ill., architect. An imposing design, and one appropriate to the location.
- 2. A Colonial residence, at Springfield, Mass., recently erected for Mr. W. S. Scott. Two perspective elevations and floor plans. Cost \$6,000 complete. Architect, Mr. G. W. Taylor, Boston, Mass. An artistic design.
- 3. A residence recently erected for Rev. S. E. Smith, at Corcoran Manor, Mount Vernon, N. Y. Perspective elevation and floor plans. Cost \$7,500 complete. Mr. A. M. Jenks, Mount Vernon, N. Y., architect. An attractive design.
- 4. A dwelling at Hasbrouck Heights, N. J. Perspec tive elevation and floor plans. Cost complete \$3,500. S. A. Dennis, Arlington, N. J., architect. A modern and attractive design.
- 5. Two perspective elevations and floor plans of a country house, at Lawrence Park, Bronxville, N. Y., recently erected at a cost of \$10,000 com plete. Mr. Wm. A. Bates, New York City, architect. One of the most artistic and picturesque country houses in Westchester County.
- 6. Public school No. 9, of Erie, Pa., recently erected at a cost of \$38,000 complete. Mr. Joseph Frank, Erie. Pa., architect. The design combines a striking exterior appearance and a convenient interio arrangement.
- 7. A half-timbered cottage of moderate cost recently erected at Glen Ridge, N. J. Architect, Mr. E. R. Tilton, New York City. A pleasing design.
- 8. A view of the Washington Arch, New York City Designed by Mr. Stanford White, of the architectural firm of Messrs. McKim, Mead & White, New York City.
- 9. View of the new Surety Building, New York City. being the loftiest inhabited building in the world.
- The world's tallest structures.—Powerful dredge for the Mississippi River.—The centenary of the Institute of France.-A new corner grate, illustrated,-The "American Trackless" sliding door hanger.-The Handco "straight flush" closet, iilustrated.—A simple and efficient pump, illustrated. Staining wood.-Artificial fuel.-Ancient glass makers -House numbering .- Fires in "sky scrapers."-Non-heat conducting coverings, illus trated. - Improved wood. working machinery, illus-

The Scientific American Building Edition is issued monthly. \$2.50 a year. Single copies, 25 cents. Thirtytwo large quarto pages, forming a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates and fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

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The best book for electricians and beginners in elec tricity is "Experimental Science," by Geo. M. Hopkins. By mail. \$4; Munn & Co., publishers, 361 Broadway, N. Y.

Whereas, the copartnership heretofore existing in the City and State of New York between Orson D. Munn and Alfred E Beach, under the copartnership name of Munn & Co., and baving its principal place of business at No. 361 Broadway, in the City and State of New York, has been dissolved by the death of Alfred E. Beach on January 1, 1896; and

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(Signed) ORSON D. MUNN. [L.S.]

In presence of A. A. HOPKINS.

City and County of New York, ss: On this 6th day of January, in the year 1896, before me personally came Orson D. Munn, to me known to be the individual described in and who executed the foregoing instrument and acknowledged to me that be executed the same for the purposes therein mentioned.

(Signed) A. A. HOPKINS Notary Public,

Kings County, New York. Certificate filed in New York County.

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of Minerals sent for examination should be distinctly marked or labeled.

(6711) F. W. B. asks for directions for making an ever-ready pad for rubber stamps: A. The following is said to be a cushion that will give color permanently. It consists of a box filled with an elastic composition, saturated with a suitable color. The cushion fulfills its purpose for years without being renewed, Total height from curbstone to coping, 314 feet, ways contains sufficient moisture, which is drawn from the atmosphere, and contin to act as a color stamp 10. Miscellaneous Contents: A great bell.—CalvertVaux. cushion so long as a remnant of the mass or composition remains in the box or receptacle. This cushion or pad is too soft to be self-supporting, but should be held in a low, flat pan, and have a permanent cloth cover. 'Th composition consists preferably of 1 part gelatine, 1 part water, 6 parts glycerine, and 6 parts coloring matter. A suitable black color can be made from the following materials: 1 part gelatine glue, 3 parts lampblack, aniline black, or a suitable quantity of logwood extract, 10 parts of glycerine, part absolute alcohol, 2 parts water, 1 part Venetian soap, 1-5 part salicylic acid. For red, blue or violet, 1 part gelatine glue, 2 parts aniline of desired olor, 1 part absolute alcohol, 10 parts glycerine, 1 part Venetian soap, and 1-5 part salicylic acid. The following are two additional receipts used for this purpose 1. Mix and dissolve 2 to 4 drm. aniline violet, 15 oz, alcohor, 15 oz. glycerine. The solution is poured on the cushion and rubbed in with a brush. The general method of preparing the pad is to swell the gelatine with cold water, then boil and add the glycerine, etc.

(6712) F. W. writes: I would like to of any Architectural Publication in the world. Sold by ask a few questions concerning an acetylene gas plant arranged on the principle of the one described on page 8 

How large would generator hottle and receiver have to be to supply two jets that have been used for coal gas (ordinary dwelling house size). Can acetylene gas be used in such fixtures? A. You cannot use ordinary burners for acetylene. Use 1/2 foot burners. A 1 cubic foot gasholder and a 2 quart generating jar will supply them nicely. It is well to have separate inlet and outlet pipes for the holder. 2. Are the chemicals employed very corrosive? Can iron or brass connections and stopcocks be used where flexibility is not essential? A. Use ordinary fittings, avoiding brass and copper. 3. Where can calcium carbide be obtained (that is, where could I get a small amount of it)? A. Address Eimer & Amend, 305 Third Avenue, New York, N. Y. 4. Is there any more danger of explosion in acetylene gas than in coal gas A. Not so much.

(6713) G. H. DeL. asks: 1. On a 500 volt street railway circuit, how much current does any one car take at full load? A. At 50 horse power 75 amperes could be taken. 2. I have a small bipolar shuttle armature motor, capable of driving a twelve inch fan with six small cells of plunge battery. Is there any possible way of altering the winding so as to have it act as a small generator producing enough current to light one or more miniature incandescent lights of 1, 2, 3, etc., candle power. Could you refer me to some SUPPLEMENT describing a small dynamo? A. You will have probably very little satisfaction in making the change, unless the field is of cast iron, so as to possess residual magnetism. For small dynamos we refer you to our SUPPLEMERT, Nos. 161, 599, 600, and 844. No. 599 describes a drum armature, much the book for No. 161. 3. Having the voltage and am perage given, how can the resistance be found? The am perage and resistance to find the voltage? And the resistance and voltage to find the amperage? A. Let C=

amperes, E=volts and R=ohms. Then  $C=\frac{E}{R}$ ;

E=CR;  $R=\frac{C}{C}$ . 4. What is fastest rate of speed ever attained by a locomotive in the United States? A. We refer you for items on recent railway speeds to the Sci-ENTIFIC AMERICAN, vol. 68, No. 20; vol. 72, No. 22; vol. 74; No. 1.

(6714) R. N. T. says: Will you give me formulas for computing the elements of a safety valve



A. Let W = the weight,

L = distance between center of weight and fulcrum in inches.

Let w = weight of lever in pounds.

Let g = distance between center of gravity of lever and fulcrum in inches.

Let 1 = distance between center of valve and fulcrum in inches.

Let V = weight of valve and spindle.

Let A = area of valve in square inches.

Cet P = pressure at which the valve is to blow off, per square inch.

Then the weight required to balance a given pressure at any given distance on the lever will be by the formula:

$$W = \left\{ (P \times A) - \left( V + \frac{(w \times g)}{1} \right) \right\} \times \frac{1}{L}$$

When the weight is at hand and known, and the disance is required, then

$$\mathbf{L} = \left\{ (P \times A) - \left( \mathbf{V} + \frac{(\mathbf{w} \times \mathbf{g})}{1} \right) \right\} \times \frac{1}{\mathbf{w}}$$

The elements between the brackets to be computed first. To obtain the area of the valve, multiply the square of the diameter by 0.7854.

(6715) D. P. D. says: Please let me know, through the Scientific American, how to put a ¼ in. hole through a heavy glass bar? A. This can be done with a hard drill and spirits of thrpentine—a tedious and uncertain process, and only for small holes. A diamond drill is much better and cheaper, if there are many holes to drill. If large holes are wanted, from % in. to 1 in, or larger, prepare a piece of thin tubing of brass or copper, of the required size of hole, of 1 or 2 in. in length, with small spindle and grooved pulley attached, something after the style of the watch maker's pow drill. Fasten upon the plate of glass, at the point to be drilled, a ring of metal or wood for a guide to keep the tubular drill in its place, until the cut is started sufficiently to steady the cutter. Lay the glass plate horizontally, and work the drill perpendicularly with the bow, using one hand to steady the upper end of the drill stock, Feed emery (about No. 90) and water into the open end of the tube as fast as required. In a very short time you will cut adisk out of the plate. Another plan is to heat the drill to a low cherry red and plunge in a solution of chloride of zinc (soldering fluid). This gives the drill an exceedingly hard edge; grinding removes the hard portion. Therefore, the drill must behardened after grinding.

(6716) C. J. M. asks how to make leaf photographs. A. Pass the paper first through a solution of gelatin, 1 part in 20 parts of hot water, and use a strong solution of potassium bichromate; or the gelatin and bichromate may be used together. Wash with hot water. A strong blue blackground may be produced as follows: Dissolve in 2 oz. of pure water 120 grn. of red prussiate of potash (potassium ferrocyanide), and separately 140 grn, double citrate of iron and ammonium in 2 oz. of water; mix the solutions, filter, float the paper for a few minutes on the filtrate; print from the dried paper as before, and wash thoroughly in water. By adding a little phosphoric acid to the bichromate solution and exposing the print before washing to the vapor of a hot solution of amiline in alcohol, a blackish-green or red positive is obtained. Or, prepare the paper with solution of iron sesquichloride, and develop after exposure with a very dilute solution of silver nitrate. Use plain photographic paper.

(6717) G. D. H. says: Can you give me

The diameter of the driven being given, to find its num ber of revolutions

Rule.-Multiply the diameter of the driver by its number of revolutions and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven.

Ex.—Twenty-four in. diameter of driver  $\times$  150, number of revolutions, = 3,600 + 12 in. diameter of driven = 300.

The diameter and revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time.

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of required revolutions of the driven; the quotient wiil be its diameter.

Ex.—Diameter of driver (as before) 24 in. × revolutions 150 = 3.600. Number of revolutions of driven required = 300. Then  $3,600 \div 300 = 12$  in.

The rules following are but changes of the same, and will readily understood from the foregoing examples: To ascertain the size of the driver.

Rule.-Multiply the diameter of the driven by the numher of revolutions you wish to make, and divide the product by the required revolutions of the driver; the quotient will be the size of the driver.

To ascertain the size of pulleys for given speed.

Rule.-Multiply all the diameters of the drivers together and all the diameters of the driven together; divide the drivers by the driven; the answer multiply by the known revolutions of the main shaft.

#### TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for beens at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be bad on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office Scientific American, 361 Broadway, New York.

## INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

January 28, 1896,

### AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising apparatus, J. H. Scott. 553,569 Advertising device, A. C. Doster. 553,558 Advertising device, M. H. Richardson. 553,558 Advertising or other apparatus, flexible carrier for, A. C. Allyn. 553,770 Air and gas mixing machine, B. S. Dunn. 553,577 Air brake, H. F. Noyes. 553,563 Air beater, H. G. Dobrman. 553,750 Alarm. See Low water alarm. Amalgamator, S. A. West. 553,634 Armature for electric machines, R. M. Gardner. 553,634 Atomizer, C. Ruppolt.
Advertising device, A. C. Doster
Advertising or other apparatus, flexible carrier
Air and gas mixing machine, B. S. Dunn
Air brake, H. F. Noyes
Alarm. See Low water alarm.
Amaigamator, S. A. West
Atomizer, C. Ruppolt
Atomizer, C. Ruppolt
Armature for electric machines, R. M. Gardner. 553,507 Atomizer, C. Ruppolt. 553,703 Auger, earth, H. Pederson. 553,703 Axles, roller bearing for railway car, P. N. Boucher. 553,603 Baine press, F. L. Robison. 553,703 Barrel charging or discharging apparatus, E. Friedman. 553,703 Barrels, method of and apparatus for making, R. Klinger. 553,809
Bag bolder, F. Goff
Baling press, F. L. Robison
Friedman 553,709
Klinger
Basins, combination supply and waste fixture for
wash, J. Totham
tery, Rearing antifriction A H McMaster 553 656
Bearing, ball, Meyer & Carrer 553,588
Bedstead fastening, J. T. Watkins
Belt stretcher. G. M. Parsneau
Bicycle bub. self-oiling, O. Kraus
tery, Bearling, antifriction, A. H. McMaster. 553, \$66 Bearling, ball, Meyer & Cairer. 553, \$66 Bearling, ball, Meyer & Cairer. 553, \$68 Bedestead fastening, J. T. Watkins. 553, 768 Bedestead fastening, J. T. Watkins. 553, 768 Bell, bicycle, H. S. Pullman. 553, 588 Bell stretcber, G. M. Parsneau. 553, 869 Bicycle babit, H. W. Rood. 553, 869 Bicycle pabit, H. W. Rood. 553, 869 Bicycle peda, I. F. D. Owen. 553, 861 Bicycle peda, I. F. D. Owen. 553, 863 Bicycle peda toe clip, A. A. Bailey. 553, 863 Bicycle seat back support, W. E. Prail. 553, 722 Bin. See Flour bin. Bloomers, T. H. Royce. 553, 732 Blow pipe, T. B. Walmsley. 553, 742 Blue, laundry, J. W. Fuller. 553, 556 Boiler. See Hot water or steam boiler. Marine boiler. Steam boiler. 554, 556
Bicycle pedal toe clip, A. A. Bailey
Bicycle seat back support, W. E. Prall 553,722 Rin. See Flour hin
Bloomers, T. H. Royce
Blue. laundry, J. W. Fuller
Boiler. See Hot water or steam boiler. Marine
Book cover, C. L'Enfant
Book, manifold sales, J. Bengough
Bottle filling device. J. Iredale
Rottle stopper, safety, L. Landau
Brake. See Air brake.
Burner, See Fuel burner
Bustle, shoulder, T. P. Taylor
Button feed mechanism, W. E. Bennett 553,893
Silve   See Hot water or steam boiler   Marine
Cane mill, C. A. Calvert 553,607
Car coupling, P.C. Ewart
Car coupling, J. M. Larkin
Car fender, M. F. Flynn
Car fender, L. Hachenberg
Car fender, R. C. McGuire
Car fender, street, H. L. Bedford
Car, band, A. Hitt
Car pilot, railway, E. P. McKaig 553,787
Car replacer, Herstrom & Grandjean 553,818 Cars and locomotives, construction and connec-
Car, band, A. Hitt
Jackson
Jackson. 553,529 Card punching machine, Jacquard, H. Hardwick. 553,783 Cardboard, adjustable cutter for cutting, C. W. Hobbs. 553,526
Hobbs
Hobbs. 53,526 Carding engine feeding mechanism, F. A. Flather 553,671 Carpet sweeper, A. D. & A. B. Linn. 553,812
Carpet sweeper, A. D. & A. B. Linn. 553,812 Carriage iron, F. S. Carr. 553,668 Carrier. See Cash and package carrier.
Carrier.         See Cash and package carrier.         53,548           Cash and package carrier.         Weaver & Barr.         53,548           Cash check holder and cutter, A. D. Joslin         53,689           Casting, production of moulding and core sand for, K. Prinzler.         53,588           Chain, lock, P. S. Kingsland.         53,686           Checkrein attachment, F. L. Adams.         53,536           Checkrein attachment, F. L. Adams.         53,531           Check, drill, G. S. Long.         53,531           Churn and ice cream freezer, combined, W. H.         De Camp.         53,531           Clear hund machine, Rosenberger & Jackson.         553,751           Clear hund machine, Rosenberger & Jackson.         553,751
Cash check holder and cutter, A. D. Joslin 553.620 Casting, production of moulding and core sand
for, K. Pringler
Chain, lock, P. S. Kingsland
Cheese cutter, N. J. Smith
Churn and ice cream freezer, combined, W. H.
Churn and ice cream freezer, combined, W. H.  De Camp. 553,554  Clgar bunch machine, Rosenberger & Jackson. 553,761  Clgarette machine, W. Briggs. 553,567  Clgarette splitting machine, J. F. Hartigan. 553,567  Cleaner. See Disb cleaner. 553,569  Condiment bolder 1 Frys. 553,560
Cigarette machine. W. C. Briggs
Cigarette splitting machine, J. F. Hartigan 553,583 Cleaner. See Disb cleaner.
Condiment holder, J. Frye. 553,580
Copying device, E. Terrell
Copying machine, J. O. Deckert
Corset clasp Protector, J. C. Gilroy 563,611
Coupling. See Car coupling.
Crucible, C. Capper
Cleaner.         See Disb cleaner.           'condiment bolder, J. Frye.         553,589           Cgoker.         coffee, W. B. Lancaster.         553,650           Copying device, E. Terrell         553,650           Copying machine.         J. O. Deckert.         553,650           Cordage machine.         interlocked.         McKay         563,623           Corset clasp protector, J. C. Gilroy         553,650           Cotton gin, saw, J. Rice         553,597           Coupling.         See Car couplins.           Cruetble, C. Capper         553,702           Cultivator, F. E. Davis.         553,704           Cutter.         See Cheese cutter.         Bowl cutter.         Pipe           cutter.         See Cheese cutter.         Dowl cutter.         Pipe
Cutter. See Cheese cutter. Dowel cutter. Pipe
cuttor
cutter. Dark room, F. A. Wattenberg 553,743