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 times.

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. Naturally, the subject is treated somewhat superficially, and perhaps for that reason is all the better adapted for the 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 journalism.

SCIENTIFIC AMERICAN BUILDING EDITION.

JANUARY, 1896.—(No. 123.)

TABLE OF CONTENTS.

The Scientific American Building Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two 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.

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 newsdealers. MUNN & CO., PUBLISHERS, 361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

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 having 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

Whereas the said copartnership had business relations with foreign countries and transacted business in the State of New York for a period of five years and upward; and

Whereas, I, Orson D. Munn, the surviving copartner, am desirous to continue the business conducted by the said copartnership and to continue the use of the name of Munn & Co.

Now, I, Orson D. Munn, do hereby certify and declare that I am the person dealing under such name of Munn & Co., and that my place of abode is 14 East Twenty-second Street, City of New York, and that my principal place of business is at No. 361 Broadway, in the City and State of New York.

(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 he executed the same for the purposes therein mentioned.

(Signed) A. A. HOPKINS,
[L.S.] Notary Public,
Kings County, New York.

Certificate filed in New York County.

Notes & Queries

HINTS TO CORRESPONDENTS.

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.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

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

Books referred to promptly supplied on receipt of price.

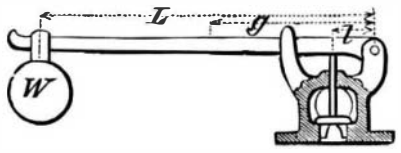
Minerals sent for examination should be distinctly marked or labeled.

(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, always contains sufficient moisture, which is drawn from the atmosphere, and continues to act as a color stamp 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. The 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 color, 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, alcohol, 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 ask a few questions concerning an acetylene gas plant arranged on the principle of the one described on page 8 of the SCIENTIFIC AMERICAN of January 4, 1896. 1. How large would generator bottle 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 ⅛ 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 SUPPLEMENT, Nos. 161, 599, 600, and 644. No. 599 describes a drum armature, much the best for No. 161. 3. Having the voltage and amperage given, how can the resistance be found? The amperage 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 $C=\frac{E}{R}$; $E=CR$; $R=\frac{E}{C}$. 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 SCIENTIFIC 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 l = 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:

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

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

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

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 turpentine—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 ¼ 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 bow 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 a disk 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 be hardened 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 aniline 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 simple rules for calculating the speed of pulleys? A. The diameter of the driven being given, to find its number 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 × 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 will 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 ÷ 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 number 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.

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.]