Discoveries in Pompeii.

The excavations at Ponipeii are a continual source of interest. The new system of conservation inaugurated this year makes them doubly important. The last mansion unearthed in the buried city, whose history every one now knows so well (or ought to know), has been made the test of these improved methods instituted by the able and excellent directors. Instead of hiding away the statues, pictures, and other movable objects in the Naples Museum, as has previously been the custom, everything has been left in situ, and many objects sufficiently restored to give an idea of their original appearance. The excavation may be said to have begun in August of 1894; but the weather and lack of was reached; but during the winter the work progressed slowly, and the last rooms were not unearthed till June, 1895, the labors of restoration, cleaning, and preservation not being completed till August, exactly a year from the date when the first layer of earth was removed. The main entrance of the house leads into a street still blocked up with rapilli; it consists of an ostium, or passage, on one side of which sat the janitor, his little division being separated by a partition of wood that has disappeared. Facing his seat is a semi-"religious" picture, only suitable to that barbarous period of Europe's history, and which has now very properly been covered over. There were two great doors in this passage. On the outer wall of the house can be seen the remains of the iron hinge and staple that held the bar across the outer door when the house was locked up and the family had deserted it.

The room on the left of the ostium contains two small and ordinary pictures of the stereotyped kind: one represents Leander swimming across the Hellespont to Hero; the other Perseus in his ship deserting Ariadne. . . On the opposite wall is a picture of Cephalus and his devoted wife Procris, in the form of a wounded deer, the latter being probably also represented by the woman high in the left of the same painting gazing earnestly at her husband. These pictures are let into the wall, and the prepared stucco on which they were painted was probably first laid on a board, to afford greater facility to the artist, and then, when it had dried, was inserted in the space prepared for it in the stucco on the wall's surface; the brown, yellow, or sometimes black band of paint that usually borders them hides the joining line. In the thyrsus and a bacchante with a tamboureen, while two

centaurs appear on the tops of this delicate painting. The garlands painted on the white wall, the architectural studies capped with winged sphinxes, and the cornices of red, white, and blue mouldings above and below the frieze, and separating it from the curve of the arched ceiling, add immensely to the appearance of the colors; and this elaborately painted apartment is the more attractive by the amount of brilliant red cinnabar that has been used in its decoration, and that adds considerably to the splendor of the effect.

Beyond this room, at the side of the atrium, is a side passage leading through the kitchen into the little street named by Fiorelli the Vicolo di Mercurio; in it funds retarded the work. In November the atrium is a staircase. Near its entrance in the atrium are the remnants of a safe, once built and riveted on a foundation of heavy stones. The iron parts are original, but the case of wood on which they are fastened is modern. Near this safe were found a bronze ring and two seals, both of iron, which are preserved in the house of the Administration of Pompeii preparatory to going to the Naples or the local museum. On one of the latter is "A. VETTI. RES. V.," and from this the house is to be called the "Casa di Vetti." On the opposite side of the atrium is another and larger safe, likewise restored. Both safes bear evidence of having been broken to pieces either by those who had dug their way down darkness on the very night itself of the destruction of the city, when the mountain's awakened "voice at halls," and

Temple and tower went down and left a site:

A delicate little gold chain, with pearls and a few coins, besides a bronze seal with the name "P. CRVSTI. FAVSTI," were found in the highest level of earth over the rooms on the right of the atrium; but these objects may have belonged to the owner of another house, and not to the proprietor of the safes. Close to the larger of these latter is the entrance to an irregular shaped room, that contains a lararium, or altar. It stands out from the wall about eight inches, and on its sides rise two columns; between them, painted on the back of the niche sunk in the wall, is the usual picture of the two Penates or genii, and a female between them who represents either the Lar or, as some suppose, Vesta; at their feet is the tutelary genius in Exhibition in 1893, and since then in London, at each frieze is seen Leda and the swan, a bacchant with a the form of a serpent, which is the symbol of regener- of which places it attracted a considerable amount ation, or of new life, accepting the offering of fruit of attention.

placed before him on a small altar. The colors are wonderfully fresh, the tints are principally red, brown

When the garden in the marble-decked peristylium is again green with shrubs, and its beds continually stocked with gay and sweet-scented flowers, the mansion will assume (except in its protecting roofs) an aspect as if the inhabitants had only just deserted it, and the earthquake had only lately taken place.—H. P. Fritzgerald Marriott, in the English Illustrated Magazine.

A Lighthouse at Cape Hatteras.

Work on the Diamond Shoal lighthouse, off Cape Hatteras, is to be begun next spring. The new plans contemplate an immense structure, built on the screw pile order, with the foundation of the light practically 100 feet beneath the wave surface and protected on all sides by hundreds of tons of riprap to prevent damage from shifting sands. Iron piles will be driven down by hydraulic pressure until a sound footing is secured, and the actual structure for the lightkeepers and materials to maintain the light will be built on the interior of the skeleton to a height of 165 feet above the water. The cost of the structure when completed is estimated at \$1,200,000, and of this sum there is now available \$400,000. Diamond Shoal projects into the house, or perhaps by thieves under cover of into the sea seven miles off Hatteras, and is covered with from 6 to 20 feet of water. It is marked now only by Hatteras light, standing on shore seven miles from intervals" was heard roaring "through those roofless the outer edge, and not discernible in hazy or foggy weather. The proposed light will be on the extreme edge, seven miles from the nearest shore, and visible twenty-three nautical miles. The latest fog apparatus will be provided, and there will be accommodation for three keepers. It will probably take two years to complete the project from the date the work begins. When completed it will be the most notable lighthouse in the world.—Army and Navy Journal.

> THE Lancet announces that a subscription has been opened in Bristol to provide for the purchase and retention in that city of the celebrated collection of relics belonging to Jenner in connection with his introduction of vaccination. The collection is at present the property of Mr. Frederick Nockler, of Wottonunder-Edge, and was exhibited by him at the Bristol

RECENTLY PATENTED INVENTIONS. Railway Appliances.

CAR FENDER.—Charles A. L. du Quesnay, New Orleans, La. A frame secured to the front end of a car carries an inclined pivoted netted fender, the fender being curved upward at its rear end to form a protecting pillow. A spring-controlled front strand of the fender is adapted to yield inwardly, when a person is caught in the path of the moving car, and when one falls on the fender it is tilted and its front end raised to lift the feet from the ground, the head and shoulders being protected by the pillow.

CAR BRAKE. — George E. Wheeler, Minneapolis, Minn. This is a brake more especially on the part of the motorman or gripman, and not inter. fering with the ordinary brake, which may be left on the car for use in case of accident. The improvement comprises a fixed and a loosely mounted bevel faced wheel on the axle in proximity to each other, and both adapted to be engaged by a conical friction wheel on a shaft connected with a hand lever extending upward

CAR OR VEHICLE DRAUGHT DEVICE. James H. Turbush, New York City. This improvement provides conveniently attachable supports for the inward and outward thrust of the drawbars, the supports being rigid and constituting travelers upon which the followers may have movement, while relieving the confining strap or tie for the springs from the strain they ordinarily sus

CAR DOOR.-Thomas W. Bradman and Harrison Hines, Beardstown, Ill. This is a sliding exteadapted to be locked in closed position being moved outward into suitable keepers at the top and two sides of the door by a crank, when a seal finger may be conveniently applied. The door is easily opened and closed, and is designed to afford effective protection to property in cars on which it is employed.

RAILWAY RAIL NUT LOCK. - Green Smith, Montgomery, West Va. This device has a base plate that may be extended or adjusted longitudinally to bring its bolt apertures into alignment with the rail and fish plate aperture, a ratchet washer having a recessed outer face receiving the adjacent face of the nut to be locked. The ratchet washers having nut receiving re cesses, the improvement may be applied to any polts and nuts now in use on railroads, or the ratchet teeth may be formed directly on the nuts where they are to be supplied with the other parts.

Miscellaneous.

BICYCLE.—Samuel A. Donnelly, Chicago, Ill. This is an improvement on a formerly patented invention of the same inventor, and the box or casing for the bearings consists of two parts, each having a radial Eric, Ala. A connecting bar pivotally connected with R. Desjardins, Attleborough, Mass. This is a corner its character in the United States. The volume for 1896

has upper and lower bifurcated truss members, each formed of a single rod doubled at its middle, the head having arms with sockets to receive the doubled ends of the members, while the saddle block, at the angle of the upper member, has angular grooves to receive the member, there being straight transverse stay rods whose upper ends enter sockets in the block, and a bolt which clamps the block to the parts in contact with it.

PROPULSION OF VESSELS—James H. Meacham, Petersburg, Va. An endless band propeller. patented by this inventor, comprises sprocket wheels at some distance apart on each side of the vessel, the sprocket chains or bands of steel, copper, or other metal adapted for use on street cars, requiring but little effort with suitable tenacity and flexibility, carrying the buckets or paddles. To avoid undue strain upon the bands, the wheels are polygonal, but are rounded instead of presenting true angles, and the paddles may be feathered

VENDING MACHINE. - Charles W. Goldsmith, New York City. This is a coin-controlled apparatus especially adapted for delivering bulky packages, and has two pairs of oppositely arranged supports W. Dosch, Kittanning, Pa. This nozzle is forked, one movable toward and from each other, and capable of sup. of the members carrying an adjustable yoke in which is porting alternately crossed elongated packages, each pair of supports alternately dropping a single package for delivery. The coinway is of the usual construction, and coins cannot be inserted when the merchandise has been exhausted.

DENTAL FILLINGS.—James W. Dennis. Cincinnati, Ohio. An absorbent of mercury during the process of filling teeth with amalgam has been provided by this inventor, consisting of rubber saturated with comminuted metal having an affinity for amalgam, the material thus formed being apertured, whereby a maxi rior freight car door, on the upper part of which are mum of metallic surface will be presented to the amalhangers adapted to move upon a track, and the door is gam filling. The material may be made into pads or plugs of a size or shape to enter a tooth cavity, and thus three bolts actuated from a central disk, the bolts facilitate making non-shrinkable metallic fillings by absorbing the surplus or loose amalgam.

Lock. - Lewis O. Wilson, Charleston, blade open or closed as usual. West Va. This is an improvement in knob locks, pro viding a lock more easily applied to doors by simply boring a hole instead of mortising in its edge, the lock being capable of being unlocked only from the inside. The lock has a slotted cylindrical barrel in which is a spring-acting bolt with a hole, in which is arranged a retracting bar whose end extends into a slot in a frame plate on the outside of the door. A knob shaft with crank also receives the end of the retracting bar.

PHOTOGRAPH PRINTING FRAMES. Allen E. Willis, Oxford, N. C. An automatic register for keeping tally of the number of prints in the frame has been devised by this inventor, the improvement permitting the examining of prints without disturbing the register and the proper setting of the register in case a print is speiled. A toothed bar is mounted to slide in guideways on the print-holding back, a pawl engaging the bar, while a spring-pressed cam arm connected with the pawl is adapted to be engaged by the frame.

HAME FASTENER.-Joel P. McAhee,

lug and opposite inturned lip receiving and engaging the one of the hame sections, according to this improvement, lip of the other part. An improved diamond frame also has a latch extension and head, while a keeper pivotally connected with the opposing section has recesses to receive the latch extension and a locking device. The improvement is especially adapted for hames having iron bands, the fastening device facilitating the connecting of the two members of the hames at the bottom around the collar and the necessary adjustment to fit any size of collar.

> SLEIGH BRAKE. - Adelbert Mecham, Edinburg, North Dakota. This is an improvement on a formerly patented invention of the same inventor, providing means whereby the brakes may be strengthened and the drag bar readily lifted from the ground when it is necessary to back the sleigh. A brake bar is employed for each runner, terminating in a shoe as wide and strong as desired, and the brakes are automatically applied when the team backs, as in going down hill, the braking engagement being removed when the team pulls forwardly. In going up hill the drag bar enters the surface when the team stops.

> Hose Nozzle.-John M. and Albert a cone, there being a three-way cock in the nozzle at the junction of its members, the nozzle being adapted for either garden or fire purposes, and providing for bringing into action instantly either a solid or a spray stream. The spray is thrown outin conical form, covering a large area, and may be conveniently made either coarse or

> POCKET KNIFE.-William Schmachtenberg, New York City. This is a knife in which the blades may be opened without using the finger nails, a lever fulcrumed inside the handle engaging the knife blade near its fulcrum end to swing the blade to partly open position, and this lever being moved by the shank of a button on the outside of the handle. There is a similar lever for each blade in opposite sides of the handle, a spring in the back of the knife holding the

> SELF-CLOSING LACING HOOK. -La Roy S. Upton, Governor's Island, N. Y. This is an article adapted especially for use on shoes or gloves, and the hook is composed of two parts, a fixed base seated in the leather and having at one side a vertical arm or hook, another movable part being a lower swinging arm pivoted to the base arm and normally closing the open side of the hook. By drawing the string outwardly or laterally against the movable arm it is opened and the string disengaged, while by passing the string laterally between the open arms and drawing it taut, its re-engagement is automatically effected.

Designs.

SCARF RACK.—Homer E. Eyman, Lancaster, Ohio. This rack has convergent ornamental holders adapted to retain a number of scarfs, rising from a circular base and presenting convergent openings

TABLE CLOTH FASTENER.—Theodore

piece with scalloped shell-like top portion and two spring side and bottom members for holding a table cloth in position on a table.

INSCRIPTION PLATE.—Edward K. Jones, Portland, Oregon. This is a plate to be applied to sidewalks at street corners, to receive street names, advertisements, etc., the plate having a straight back edge and a wave-like curvedfront edge.

Note .- Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper

NEW BOOKS AND PUBLICATIONS.

ELEMENTS OF MODERN CHEMISTRY.

By Charles Adolphe Wurtz. Fifth
American edition. Revised and enlarged by Wm. H. Greene. M.D., and
Harry F. Keller, Ph.S. (Strasburg).

With portrait of the author and numerous illustrations. Philadelphia
and London: J. B. Lippincott Company. 1895. Pp. 808. Price \$2.50.

Wurtz's modern chemistry is so well known and enjoys so wide a popularity that it really requires no review. Sixteen yearsago the first translation was given to the American public by one of the editors of the present work. The book is now thoroughly re-edited and presents a very acceptable treatise on the science, including, we are glad to see, both argon and helium.

PRACTICAL PROOFS OF CHEMICAL LAWS. A Course of Experiments upon the Combining Proportions of the Chemical Elements. By Vaughan Cornish.
London and New York: Longmans,
Green & Company. 1895. Pp. xii,
92. Price 75 cents. No index.

It is an open question how far the study of chemistry can be treated inductively. It certainly seems that the student has a right to accept the work of the world of chemists, and that he should not be obliged to obtain for himself proof of many known chemical laws. But this little manual really gives an inductive treatment of a small portion of chemistry only enough to show how the laws can be and have been proved. We note in the preface that the work has been done by pupils from twelve to eighteen years of age, spending one and a half hours at a time in the laboratory, with two weekly attendances. We certainly think the amount of inductive research given in this manual could properly and advantageously be performed by all chemical students. The work is destitute of an index.

AMERICAN ANNUAL OF PHOTOGRAPHY AND PHOTOGRAPHIC TIMES AL-MANAC FOR 1896. Edited by Walter E. Woodbury. New York: Scovill & Adams Company. Pp. 370. Price 75 cents.

There can be no question but that this annual has come to occupy a leading position among publications of 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.)

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- 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 complete. 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.
- 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-

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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.

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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 conti to act as a color stamp 10. Miscellaneous Contents: A great bell.—CalvertVaux. | cushion so long as a remnant of the mass or composition —The world's tallest structures.—Powerful dredge 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 gast 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 dail 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 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.

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January 28, 1896,

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