

phuric and nitric acids, and then washing the acids off in running water. The acids must be those known as fuming—the most concentrated.

(29) J. D. R. says: In the study of geology, I meet with one serious difficulty: There are five principal geological periods, each of which has its characteristic formations. Geologists speak of the "oldest rocks," the "lowest rocks," etc. All their examinations are necessarily confined to the earth's surface. How, then, do they ascertain which are the lowest or oldest rocks? I understand that eruptions might leave the rocks of the interior to the surface, and that rocks of all periods might be found on the surface; but how do geologists ascertain the period to which a given rock belongs? How do they tell the age of a rock? A. The older rocks—granite and basalt—are those upon which rest the stratified deposits constituting gneiss, sandstone, etc.; they are, therefore, often spoken of as the lowest, the foundation stones. They are unquestionably the result of direct congelation from a state of fusion; while the sandstones, etc., are as evidently the product of the corrosion and attrition by violently agitated water of high temperatures. The material thus abraded and dissolved, at first held in suspension by the water, was gradually deposited and cemented as it calmed and cooled. The rocky crust, at first formed, had become wrinkled into great valleys and mountain chains by the shrinkage of the still molten nucleus and the falling in of the weaker portions of the crust. The valleys received most of the sediment, while the mountain tops, some of which projected above the surface of the water, were lightly or not at all thus clothed. Denuding floods and glaciers have since laid bare portions of these foundation rocks or cut great chasms in them, so that geologists may, without great difficulty, study their nature and that of the superincumbent strata. The order of their formation, their inclination, thickness, stratification, and nature, are the data from which their relative ages are computed. Space will not here permit us to go further into the subject. You should consult some comprehensive works on geology and on the age of the earth.

(30) E. J. W. says: I have a wood-turning lathe, the cone pulley of which has two steps, one is 3 1/2 inches, and the other 9 1/2 inches in diameter. From center of spindle to center of countershaft is 3 1/2 inches. With the 3 1/2 inch step I am running a pulley on the countershaft 2 1/2 inches diameter. I wish to put a pulley on the countershaft to run with the 9 1/2 inch step, and to use the same belt on either step. What must be the size of the pulley? A. Make it 9 1/2 inches.

What is the weight and value of a cubic inch of gold? A. About 8 1/2 troy ozs. Worth about \$173. How much heavier is a cubic foot of sea water than a cubic foot of fresh water? A. About 1 1/2 lbs.

(31) C. A. R. says: I desire a compound in liquid form, without offensive odor, which, when applied to ordinary writing paper or wood, will penetrate the same and adhere firmly thereto, and that will dry quickly when spread thinly, and exposed to the air. When dry, it should be transparent and insoluble in water. A. Perhaps an ethereal solution of balsam will answer your requirements.

Can you tell me what to add to silicate of soda to make it dry quickly when spread thinly? A. No. Use the solution hot.

(32) A. J. Z. & S. ask: 1. Is coal tar from gas houses a good thing to put on a shingle roof to preserve the wood? A. The use of coal tar as a roofing paint is open to a number of objections, chief among which are its black color and low point of fusion, which cause it, under exposure to strong sunlight, to readily absorb heat and run into the gutters, and its strong odor. Besides this it is very inflammable, and easily ignited. 2. Is there a cheap ingredient that can be mixed with it to make it dry, and to prevent it from smelting? A. The odor and liability to run may be somewhat reduced by mixing it with lime. It will not rot the wood.

(33) H. F. asks: How can I feather or crystallize on galvanized iron? A. Clean it perfectly with a solution of chloride of zinc, and you will find that the coating is already crystalline. Or use a wash of dilute nitric acid (1 of acid to 1 water), and wash in a stream of clean water.

(34) J. M. B. asks: What is the best material for a step in which a steel spindle, weighing about 1 lb., is to revolve at 4,000 turns per minute? A. Use hardened steel or iron.

(35) F. C. asks: How is the dotted shade put upon crayon drawings? A. If we understand you, the shade is composed of small dots worked in with the crayon point. 2. How can I obtain a solar print from a tin type? A. A negative of the picture is taken and is placed in front of the lens of a large camera and behind, but within the focus of, a large condensing lens. The sensitized paper extended on a frame is then introduced into the camera and exposed. The cameras used for this purpose are peculiar in shape, very long, and are provided with suitable machinery, clockwork, etc., to maintain them in the same relative position with respect to the sun, during the time of exposure.

(36) W. C. R. says: A calcium light company has several different sizes of gas cylinders in use, holding 15, 25, 50, and 60 feet of gas; and when each one is fully charged and sent out, its pressure gauge will indicate the same number of lbs., namely, 225 lbs. to the inch. By what rule can I ascertain how many feet have been used, and how many still remain in the cylinder? A. The pressure varies nearly as the quantity of gas in the reservoir; so that, when the gauge shows a pressure only half as great as the original, about half of the gas has been used, and so on. A simple method of ascertaining the contents would be to weigh the reservoir when empty, and with a definite amount of gas. From this the weight of a cubic foot of gas could be ascertained, and, by weighing the reservoir at any time, a simple calculation would show how much gas it contained.

(37) L. N. M. asks: 1. What will prevent ordinary shellac varnish from bubbling under the brush, when applied to a rough surface? A. Thin with alcohol, and give a flowing coat. The wood must be dry. 2. In repainting defaced water colors, which would be

best, colored varnish or common paint, or would neither of them answer the purpose? A. You do not say what kind of a color. Probably colored varnish would give the best results, if we understand you.

(38) S. asks: Does the diameter of an eccentric affect the position of a valve, that is, will not a locomotive work as well with one eccentric of 10 inches diameter and the other of 12 inches, as it would were both equal, providing that the throw is the same? A. There is a slight difference on account of the increased angularity of the eccentric rod. All other things being equal, the small eccentric is best.

(39) E. D. S. asks: How can I split 3/4 inch square iron either hot or cold? A. If the bar is heated to a red heat, a circular saw will answer. If the bar is cold, a fast running disk of sheet iron will cut it.

(40) G. W. R. asks: Can a steam cylinder of 3 inches bore work a 20 inch stroke? A. It would work, but would be very much out of proportion.

(41) J. W. C. asks: Can iron be welded without being heated to a welding degree, by the use of any chemical? A. No.

(42) W. F. S. says: A friend of mine says the Dead Sea is devoid of fish. I do not see why there should not be fish there as well as there is in any other water. Who is right? A. It is said to be lifeless, as its waters contain a very large quantity of chloride of magnesium, chloride of sodium, and sulphate of soda. A bath in its waters parches and cracks the skin.

(43) J. J. T. asks: How is it that all bought taps are so clean and bright? How are they tempered? A. The taps you refer to are not heated in the open fire but in heated mixtures, the composition of which we shall shortly publish.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the result stated:

J. S. B., of Cal., sends us a box marked with his initials, but no letter. It contains pieces of red jasper and quartz, with oxide of iron. The bright specks are not gold, but iron pyrites.—B. J.—No. 1 is clay with red oxide of iron. In No. 2 the bright specks are mica films, it contains no metals.—J. B., Jr.—It is red oxide of iron with clay. It is used as paint, under the names of ochre and umber.—G. B.—The crystals in No. 1 are lime iron garnets. No. 2 contains hornblende, albite, and orthoclase.—J. D. S.—No. 1 is iron pyrites in limestone. See p. 7, vol. 36. No. 2 contains carbonate of copper (malachite), limestone, and orthoclase. No. 3 contains galena (sulphide of lead). No. 4 is limonite, with a few crystals of pyrites.—A. D. T.—The material is an infusorial or diatomaceous earth. It contains very fine specimens of *pluresigma lanceolatum*, and *p. angulatum*.—A. J. A.—No. 1 is pyrites (sulphide of iron). See p. 7, vol. 36 No. 2. See "Hints to Correspondents," this page.—G. & B.—It is metallic antimony.—G. W. H.—It is bituminous shale. You will probably find coal by going deeper. Some of the shale might be used as fuel, but it contains much ash. Dr. M. B.—It is sand from decomposed granite, and is of no value.—H. M. H.—It is a kaolin (silicate of alumina) containing much talc or hydrous silicate of magnesia. It is not suitable material for crucibles, but might answer for soft firebricks.

J. H. B. asks: Is there any remedy for a parrot which, for four or five years, does nothing but pull his feathers out as fast as they appear?—C. B. T. asks: Can any one give me a recipe for manufacturing palatable cider from wild crab apples?—A. I. asks: Has there been anything invented to throw a paddle wheel off of its center? Many such wheels, and stationary engines also, stop in the dead center, and have to be pried off before they can start again.—G. S. says: I have seen in machine shops straight bars of iron 2 feet long, bolted on to shafting at different points and standing out at right angles. What are they for?

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "What do iron and steel rails cost? Are electric medical belts good for anything? What will a compression pump cost? Who sells incubators and brooding apparatus, and what do they cost? Where can powder paper be obtained? What does selenium cost per lb.?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS FOR WHICH Letters Patent of the United States were Granted in the Week Ending May 8, 1877, AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Agricultural boiler, T. S. Dobbs..... 190,424 Air engine, piston, etc., G. B. Brayton..... 190,411

Table listing various inventions and their patent numbers, including items like Milk cooler, Mill spindle bush, Millstone driver, Bale tie, etc., with patent numbers ranging from 190,436 to 190,629.

DESIGNS PATENTED.

Table listing various designs and their patent numbers, including items like INSULATORS, CARPET, ORGAN CASES, etc., with patent numbers ranging from 9,956 to 9,970.

A copy of any of the above patents may be had by remitting one dollar to MUNN & CO., 37 Park Row, New York city.